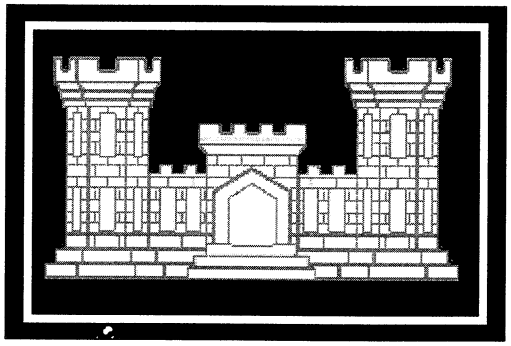
Greenup Locks Improvements

Part B-1. Environmental Impact Assessment

Environmental Impact Assessment Report

Greenup Locks Improvements



US Army Corps of Engineers
Great Lakes and Ohio River Division
Louisville District / Huntington District

July 1999

Ohio River Main Stem Systems Study
J.T. Myers and Greenup Locks Improvements
Environmental Impact Statement

3.2.2 Water Quality

3.2.2.1 Affected Environment

For the purpose of this study, the only tributaries considered by the study team were those found within ½ mile upstream and 2 miles downstream of the lock and dam. There are three unnamed intermittent streams and three streams that flow into the Ohio River from mile marker 340.5 (upstream) to mile marker 343 (downstream). All three of the intermittent streams are found on the Ohio side; one located approximately 1 ½ miles downstream, another approximately 1 mile downstream and the remaining intermittent stream flows into the unnamed embayment off of Chandlers Run approximately ¼ mile upstream from the lock and dam. Chandlers Run which feeds into the same unnamed embayment and then into the Ohio River. Streams located on the Kentucky side of the Ohio River include Pitch Branch and Grays Branch. Grays Branch and Pitch Branch meet and then flow into the Ohio River approximately 1 ¼ miles downstream (USGS, 1975; USGS, 1985). The Ohio River is approximately 400 feet from the proposed spoil disposal site.

3.2.2.2 Environmental Consequences

3.2.2.2.1 Plan 3

The potential impacts from Plan 3 on water quality are:

- Degrade water quality from increased soil erosion/runoff from construction activities, construction of a fisherman access road and construction roads, and excavation to install fill and emptying systems;
- Degrade water quality from the risk of spills during construction activities;
- Degrade water quality from dredging;
- Change ground/surface water hydrology from construction activities and new lock operation;
- Drainage/hydrology disruption from the creation of a disposal site;
- Degrade water quality from construction activities at R.C. Byrd dry dock; and
- Degrade water quality from blasting operations.

An environmental protection plan would be submitted within 30 days after receipt of the notice to proceed for review by the Contracting Officer. The contractor would not perform any work with potentially adverse environmental impact, such as excavation or other work that would increase turbidity in the river, prior to approval of the environmental protection plan.

Construction activities for Plan 3 are estimated to last 30 months. Figure __ shows the Corps property boundaries, proposed spoil disposal site and proposed laydown area. The proposed laydown area would be located at the lock near the existing bridge. Approximately 15 acres would need to be cleared and graded in preparation for the laydown area where construction equipment and materials would be stored. Soil erosion/runoff would result from the clearing and grading process, however, an erosion control plan, submitted by the contractor for approval, would be in place to help reduce soil erosion and sedimentation during construction activities to protect water quality. This plan would include measures such as the use of silt fences around the spoil disposal area, hay bales around all disturbed areas, check dams and **mud boards**.

The existing access road would be used as the main road to access the construction site. However, an access road would need to be constructed to the contractor's office area and probably from the contractor's office area to the riverbank downstream of the existing 600' chamber. Approximately 2 acres of vegetation would be cleared for construction of the contractor's access road. Haul roads would be needed to access the stock piles. Approximately 3 acres would be cleared for haul roads and the areas cleared for this purpose would be re-vegetated after completion of the new lock extension. The proposed fisherman access road would be developed along the Kentucky shoreline under consultation with the State of Ohio Department of Natural Resources (DNR), the Commonwealth of Kentucky DNR and Corps Operations personnel. **Approximately __ acres would need to be cleared for the fisherman access road.** Soil erosion/runoff would occur from the clearing and grading needed in preparation for the access and haul roads. An erosion control plan would be in place to help reduce soil erosion during construction activities to protect water quality. As previously stated, this plan includes measures such as the use of silt fences around the spoil disposal area, hay bales around all disturbed areas, check dams and **mud boards**.

The potential for fuel/oil spills and the consequent water contamination exist during the clearing and grading process, at the construction site, disposal site and at any location where the transportation or use of materials might occur. A control and disposal plan would be in place to minimize the adverse effects on water quality from the possible risks of spills during these activities. This plan would be submitted by the contractor, follow EPA standards, and would be approved by the Corps. The control and disposal plan would include procedures for addressing filling and disposal of hydraulic oil, manner of draining pipe, disposition of valves, pipe and other related construction debris, manner of collection and storage of used or split oil, manner of collection, storage and disposal of used absorbent or absorbent pads. The contractor would provide records to confirm that work was done in the approved manner.

Channel maintenance dredging is currently performed annually in the lower approach to Greenup locks. Possible re-suspension of contaminants could occur from dredging (USAEWES, 1993). Prior to maintenance dredging it is recommended that dredge material be tested for contaminants. It is anticipated that the lock extension would not alter dredging requirements in the lower approach. Dredging is also performed in the upper approach near the intake valves to remove drift, debris and sediment whenever filling times become lengthy enough to increase lockage times. The frequency of this dredging requirement is about once every 5-10 years depending on the number of high water events. The lock extension would most likely not

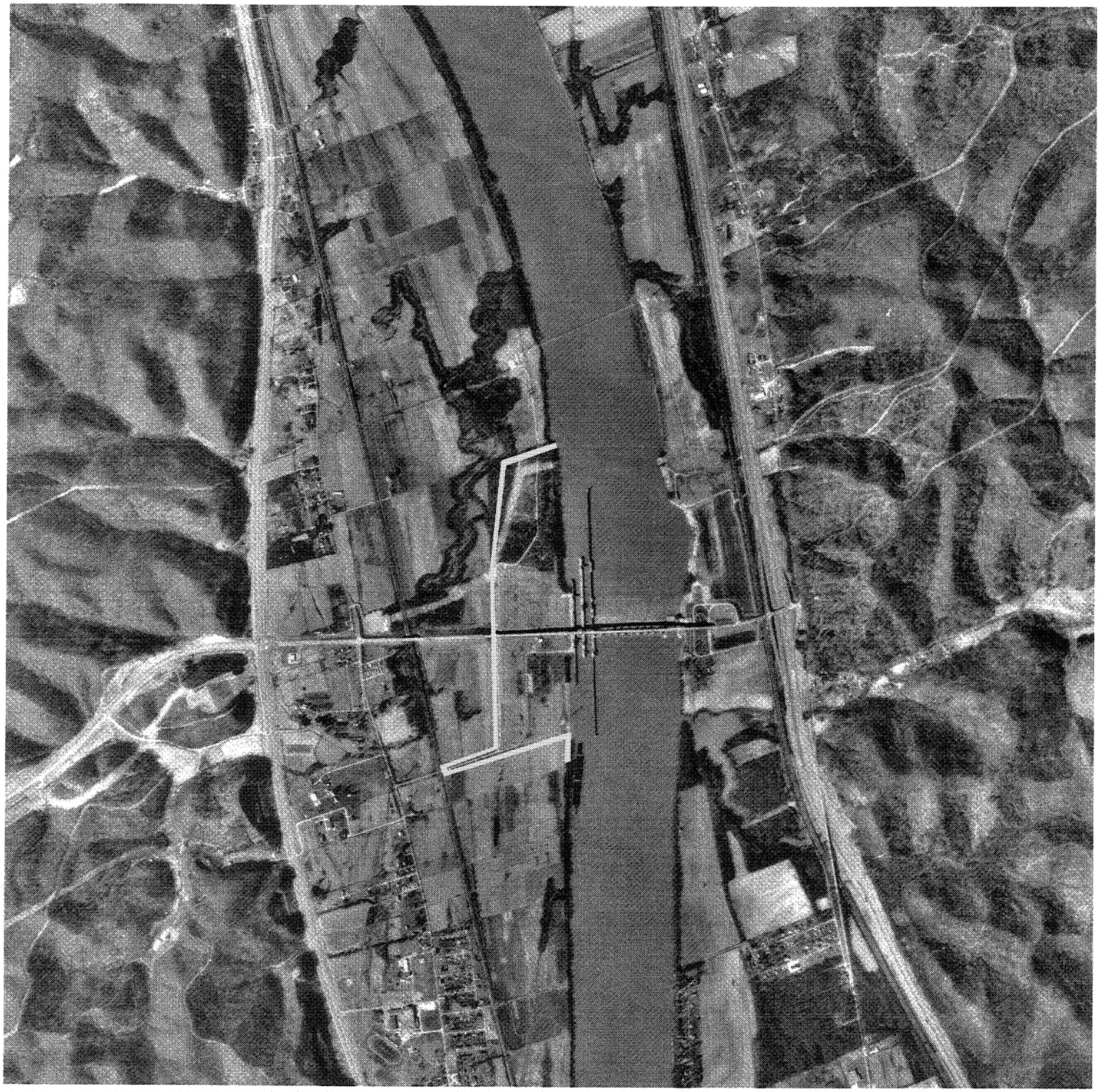


Figure _____ **Corps Property Boundaries, Proposed Spoil Disposal Site, and Laydown Area at Greenup Lock and Dam**

Key: **Boundary Line**

Scale 0 600 1200ft.

(TO BE ADDED WHEN FINALIZED)

N

change this requirement. In accordance with Corps of Engineers regulations, Phase I Hazardous, Toxic, and Radioactive Waste (HTRW) investigations were performed on the proposed construction site. The survey concluded that no track was determined to contain any HTRW concerns during construction.

The existing surface water hydrology would not be moved or altered during preparation of the laydown area, construction of the access road, the lock extension or the operation of the extended lock. Approximately 5-10 acres (about a 700-foot square) would be cleared to create a spoil disposal site. The disposal site would be approximately 600 feet from the proposed lock extension. Spoil placed at this location would be no higher than 10 feet. The proposed area is located in the 100-year floodplain, however would not affect the floodway.

The river would need to be excavated to the bedrock level. Approximately 20,000 cubic yards of spoil would be excavated and placed at the spoil disposal site. The excavation would increase turbidity and suspend solids. A floating turbidity curtain would be in place to protect the surrounding areas from the effects of excavation. The curtain would be placed in such a manner that it is of sufficient length to surround both the equipment being utilized and the area of the work with a buffer area between the equipment and curtain for sediments to settle. The curtain would have a flexible flotation device along its entire length at the top and shall have a flexible ballast at the bottom so that the curtain would hang vertically in the water when in use. The curtain when utilized would be left in place long enough for the sediment created by the operations to settle before moving in to a new location (DA, 1993).

Dewatering activities would occur behind the bulkhead/miter gate and are estimated to last approximately 2-3 months. Water quality tests would be conducted periodically during dewatering activities. During underwater excavation, spoil would be clamshelled, decanted and effluent would be tested for contaminants.

The existing dry dock at R.C. Byrd would be used to as a graving yard. Pre-cast sections for the approach wall would be floated from R.C. Byrd to Greenup lock. The pre-cast sections for the land and middle walls would be transported from the riverbank at Greenup on the downstream end by a floating crane. The same precautions that would be in place at Greenup, (i.e. an erosion control plan and control and disposal plan) would be in effect at R.C. Byrd.

A controlled blasting plan would be submitted for approval by the USACE. The plan would include a detailed description of the methods and equipment used for each operation and the sequence of operations. Provided the blasting plan is followed, no adverse impacts to water quality is expected.

3.2.2.2.2 Plan 1B. Construction activities for Plan 1B are estimated to last 30 months. This alternative involves the same amount of dredged material as outlined in Plan 3. Approximately 15 acres would need to be cleared and graded in preparation for the proposed laydown area. Soil erosion/runoff would result from clearing and grading, however, an erosion control plan would be in place to help reduce soil erosion and sedimentation during construction activities to protect water quality. As mentioned in Section 3.2.2.2.1, this plan would include

measures such as the use of silt fences around the spoil disposal area, hay bales around all disturbed areas, check dams and mud boards to retard and divert runoff to protected courses.

As noted in Section 3.2.2.2.1, the existing access road would be used as the main road to access the construction site and an contractor's access road would need to be constructed. The proposed fisherman access road would be developed along the Kentucky shoreline under consultation with the State of Ohio Department of Natural Resources (DNR), the Commonwealth of Kentucky DNR and Corps Operations personnel. Soil erosion/runoff would occur from the clearing and grading needed in preparation for the access and haul roads. An erosion control plan would be in place to help reduce soil erosion during construction activities to protect water quality.

The potential for fuel/oil spills and the consequent water contamination exist during construction activities. A control and disposal plan would be in place which to minimize the adverse affects on water quality from the possible risks of spills during these activities. The Plan 1B lock extension not change the periodic upstream dredging requirements.

As with the Plan 3 construction, the existing surface water hydrology would not be moved or altered during construction and operation activities. Approximately 5-10 acres would be cleared to create a spoil disposal site. The disposal site would be approximately 600 feet from the proposed lock extension. Spoil placed at this location would be no higher than 10 feet. The proposed area is located in the 100-year floodplain, however would not affect the floodway.

The river would need to be excavated to the bedrock level similar to Plan 3. A floating turbidity curtain would be in place to protect the surrounding areas from increased turbidity during excavation.

Dewatering activities are estimated to last approximately 2-3 months. Water quality tests would be conducted periodically during dewatering activities. During underwater excavation, spoil would be clamshelled, decanted and effluent would be tested for contaminants. Water quality would not be degraded during dewatering activities.

A controlled blasting plan would be submitted for approval by the USACE. The plan would include a detailed description of the methods and equipment used for each operation and the sequence of operations. Provided the blasting procedures are followed, no adverse impacts to water quality are expected.

3.2.2.2.3 Plan 2. Construction activities for Plan 2 are estimated to last 30 months. This alternative involves the same amount of dredged material as discussed in Plan 3 and Plan 1B. Soil erosion/runoff would result from clearing and grading, however, an erosion control plan would be in place to help reduce soil erosion and sedimentation during construction activities to protect water quality.

Similar to Plan 3 and 1B, the existing access road would be used as the main road to access the construction site and an contractor's access road and fisherman access would need to be

constructed. An erosion control plan would be in place to help reduce soil erosion during construction activities. A control and disposal plan would be in place which would help minimize the adverse affects on water quality from the possible risks of spills during construction activities.

As noted in Plan 3 and Plan 1B, the lock extension would not change dredging requirements. Existing surface water hydrology would not be moved or altered during construction and operation activities.

The river would need to be excavated to the bedrock level similar to Plan 3 and Plan 1B. Turbidity in the construction area would be minimized by a turbidity curtain.

Water quality tests would be conducted periodically during dewatering activities. During underwater excavation, spoil would be clamshelled, decanted and effluent would be tested for contaminants. Water quality would not be degraded during dewatering activities.

The existing dry dock at R.C. Byrd would be used as a graving yard. The same precautions that would be in place at Greenup (i.e. an erosion control plan and control and disposal plan) would be in effect at R.C. Byrd.

A controlled blasting plan would be submitted for approval by the Corps. The plan would include a detailed description of the methods and equipment used for each operation and the sequence of operations. Provided these procedures are followed, no adverse effects to water quality would occur.

3.2.2.2.4 Plan 4 . Construction activities for Plan 4 are estimated to last 30 months. This alternative involves the same amount of dredged material as discussed in Plan 3, Plan 1B and Plan 2. An erosion control plan would be in place to help reduce soil erosion and sedimentation during construction activities to protect water quality.

As outlined is Plan 3, Plan 1B and Plan 2, the existing access road would be used as the main road to access the construction site and an contractor's access road and fisherman access road would need to be constructed. An erosion control plan would be in place to help reduce soil erosion during construction activities to protect water quality.

A control and disposal plan would be in place to minimize the adverse effects on water quality from the possible risks of spills during construction activities.

Dredging is currently performed in the upper approach near the intake valves whenever filling times become lengthy enough to increase lockage times. The lock extension would not change this requirement. The existing surface water hydrology would not be moved or altered during construction and operation activities.

As in Plan 3, Plan 1B and Plan 2, the river would need to be excavated to the bedrock level. A floating turbidity curtain would be in place to protect the surrounding areas.

Water quality tests would be conducted periodically during dewatering activities. During underwater excavation, spoil would be clamshelled, decanted and effluent would be tested for contaminants. The same precautions in place at Greenup, would be in effect at R.C. Byrd throughout any construction activities.

The blasting plan would include a detailed description of the methods and equipment used for each operation and the sequence of operations. As stated in Plan 3, Plan 1B and Plan 2, if these measures are followed, no adverse impacts to water quality would occur.

3.2.2.2.5 No Action. The no action alternative would result in continued or increased barge congestion and queuing during maintenance operations. Extended periods of queuing would lead to increased turbidity and thus affect water quality from bottom sedimentation being disturbed.

3.2.2.3 Summary of Impacts

Table --. Summary of Impacts on Water Quality

Alternative	Impacts
Plan 3	• Soil erosion/runoff • Increased turbidity
Plan 1B	• Soil erosion/runoff • Increased turbidity
Plan 2	• Soil erosion/ runoff • Increased turbidity
Plan 4	• Soil erosion/ runoff • Increased turbidity
No Action	• Increased turbidity • Traffic congestion

3.2.3 Air Quality

Under the Federal Clean Air Act (CAA), the Environmental Protection Agency has established air quality standards in regard to the types of air pollutants emitted by internal combustion engines such as those in aircraft, vehicles, and other sources.

These National Ambient Air Quality Standards (NAAQS) apply to the ambient air, the air that the general public is exposed to every day. Areas where the ambient air does not meet these standards are said to be non-attainment areas. Areas where the ambient air meets these standards are said to be in attainment.

For this proposed action, the relevant regulatory requirement is that federal agencies are not allowed to take any action that would interfere with a state's plan to maintain or to achieve compliance with those air quality standards. Federal action must be "in conformity" with whatever restrictions or limitations the state has established for air emissions necessary to attain compliance with NAAQS.

Screening techniques are used to evaluate a project. These techniques involve determining the levels of emissions from a proposed action. They could be models or mathematical calculations. These screening techniques must be used if an area is in attainment or not. Pollutant thresholds have been established (see side panel) to determine the impact of the level of emissions. If the analysis indicates a threshold is exceeded a conformity determination will be required. The criteria pollutants for this screening are as follows:

National Ambient Air Quality Standards (NAAQS)

Under the Clean Air Act, the U.S. EPA has established limits on the average levels of pollutants in the air to which the general public is exposed ("ambient air"). Primary Standards establish the level of air quality necessary to protect the public health from any known or anticipated adverse effects of a pollutant, allowing a margin of safety to protect sensitive members of the population. The Secondary Standards establish the level of air quality necessary to protect the public welfare by preventing injury to agricultural crops and livestock, deterioration of materials and property, and adverse impacts on the environment, including prevention of reduced visibility.

Pollutant	Averaging Time	Standard[a] ($\mu g/m^3$)
Ozone	1-hour	235
Carbon Monoxide (CO)	1-hour	40,000
	8-hour	10,000
Nitrogen Oxides (NO_x)	Annual	100
Sulfur Dioxide (SO_2)	Annual[b]	80
	24-hour[b]	365
	3-hour[c]	1,300
Particulate Matter (PM_{10})	Annual	50
	24-hour	150
Lead (Pb)	¼ year	1.5

[a] Both the Primary and Secondary standards are the same value, except for sulfur dioxide.
[b] Primary Standard
[c] Secondary Standard

- *Carbon Monoxide (CO).* A colorless, odorless, toxic gas produced by the incomplete combustion of organic materials used as fuels. CO is emitted as a by-product of essentially all combustion.

- *PM-10.* PM-10 are fine particles less than 10 micrometers in diameter. PM-10 includes solid and liquid material suspended in the atmosphere formed as a result of incomplete combustion.

- *Sulfur Dioxide (SO_2).* This is a corrosive and poisonous gas produced mainly from the burning of sulfur containing fuel.

- *Nitrogen Oxides (NOx).* A poisonous and highly reactive gas produced when fuel is burned at high temperatures causing some of the abundant nitrogen in the air to burn also.

- *Volatile Organic Compounds (VOCs).* VOCs are created when fuels or organic waste materials are burned. Most hydrocarbons (HCs) are presumed to be VOCs in the regulatory context, unless otherwise specified by the EPA.

The thresholds are referred to as "de minimis" criteria, and vary depending upon the pollutant. The term "de minimis" means "so small as to be negligible or insignificant." If an action is below the de minimis emission threshold, then a conformity determination is not required.

3.2.3.1 Affected Environment

Greenup Lock and Dam is in an area classified as "in attainment." The thresholds 100 tons per year or less for each criteria pollutant in order to qualify for *de minimis*. If *de minimis* criteria is exceeded, then a conformity determination must be made.

3.2.3.2 Environmental Consequences

3.2.3.2.1 Plan 3.

The potential impacts of the construction and operation of the lock extension and additional fill/empty system include:

- Degrade air quality from a hazardous material or POL spill during the storage of construction materials, construction of lock extension, construction of access roads, excavating shore slope, blasting of existing monoliths, maintenance of vehicles;
- Create fugitive dust emissions, thus degrading air quality from site preparation such as clearing and grading, and construction of access roads;
- Degrade air quality and create fugitive dust from the equipment use during construction lock extension;
- Create emissions, thus degrading air quality from the maintenance and operation ground vehicles;
- Degrade air quality from lock operations; and

- Degrade air quality from planned spoilage burning.

The construction of the lock extension would require the clearing of various portions of the Corps property as well as require dredging and excavation in the Ohio River. A total of 30 acres would be cleared for the laydown area, spoil disposal area, access road, and haul roads. Cleared trees and scrap wood products would be burned in the spoil area on an intermittent basis over a 3-month period of time. The Corps would obtain a state permit to conduct the burning and would follow all applicable state and local regulations. The ash and residue from the burning would be left in place and covered by dredged material, which may cause fugitive dust. The dust would be controlled by sprinkling only water on the dry areas. Controlled blasting would be conducted in accordance with the Corps approved blasting plan.

Equipment required for this plan is as follows:

Table ____. Plan 3 Equipment

Equipment Type	Rating	Hours
Chip Spreader	13w	1,077
Air Compressor	100 CFM	38
	250 CFM	15,450
	375 CFM	11,675
	450 CFM	84
	600 CFM	122
	750 CFM	94
	900 CFM	276
	1200 CFM	1,560
Sandblaster	600 psi	858
Chainsaw	31"	643
Compactor	18.9"	112
	31.5"	351
Concrete Pump	65 cu yd /hr	11
	115 cu yd /hr	164
	196 cu yd /hr	15,440
Concrete Vibrator	2.5"	30,879
	3.5"	320
	6.0"	11
	High Frequency	19
Gantry w/ Boom	100 ton	630
Crane, Hydraulic	22 ton	140
	40 ton	61
	14 ton	93
	50 ton	93
	23 ton	653
LiftCrane	150 ton	877
	450 ton	386

Crane, Mechanical (ME), Crawl	75 ton	10,730
	100 ton	1,158
Drill, Air	2.5-4"	1,654
Drill, Core	400'	203
Generator	5 KWH	38
Grader		1,550
Hydraulic Hammer	1500 Ft#	1,584
Hydraulic Excavator, Crawler	2 cu yd	391
	3.125 cu yd	14,303
	1.5 cu yd	1,560
Landclearer, rotary cutter	20' cut	975
Loader, Front End, Crawler	1.5 cu yd	1,616
	2 cu yd	122
	4 cu yd	724
	7 cu yd	2
Loader/Backhoe (LD/BH), Crawler	1 cu yd	471
	4 cu yd	15
Pile Hammer	40 ton	120
	160 ton	376
	182 ton	877
Pump Water	6 gpm	203
Soil Compactor		394
Roller	15 ton	1,078
Dozer, Crawler w/Blade	D7	304
	D8	540
	D9	885
Dozer, Crawler, Angletilt	D5	381
Tractor		1,663
Trencher, Walk Behind		404
Truck, Dump	12 cu yd	2,833
Truck Flatbed	8x10	10
	8x12	1,666
	8x14	10
	8x24	25
Truck Highway	1/2 ton	260
	3/4 ton	13,144
	44300 GVW	504
	45000 GVW	162
	15000 GVW	1,222
	24000 GVW	203
	41000 GVW	943
	18000 GVW	241
	43000 GVW	2,686
Truck Off Highway	35 ton	52,575

Water Blaster	3000 psi	489
Welder, Portable	180 amp	1,212
	250 amp	885
	200 amp	1,264
	400 amp	818
Service Truck		5,855
Hydroseeder	1500 gal	236
Miscellaneous Power Tools		22,323
Small Tools		60,238
Power Mulcher		197
Cutting Torch		406
Floating Crane	100 ton	1,937
Tugboat	700 hp	1,511
Floating Crane	650 hp/35 ton	1,098
	160ton	0
	200ton	0
Tugboat	150-300 hp	1,280
Paint Sprayer		362
Drill Rig		2,088
Totals		**305,121**

Source: (USACE, 1999)

As shown in the previous table, a total of 305,121 hours of equipment usage is projected for this project. The analysis for this was accomplished using the following sources from the Environmental Protection Agency (EPA):

- Mobile Source Observation Database (EPA,1999)
- Nonroad Emissions Model (EPA, 1999a)
- AP-42, Compilation of Air Pollutant Emission Factors, Vol. II Mobile Sources (EPA, 1998).

Hourly and average daily emission rates were determined from these sources. These emission rates were then multiplied by the number of hours per equipment (shown in the previous table). The emissions associated with the level of activity associated with Plan 3 is shown in the following table:

Table ___. Plan 3 Emissions

Emissions in Tons							
	VOC	**CO**	**NOx**	**SOx**	**PM**	**CO_2**	**Fugitive Dust**
Year 1	2.01	11.59	13.16	3.64	1.46	1,012.69	
Year 2	11.40	65.60	74.49	20.60	8.29	5,733.90	
Year 3	0.47	2.72	3.08	0.85	0.34	237.46	
Total	13.89	79.91	90.73	25.09	10.10	6,984.04	

As depicted in the preceding table, none of the criteria pollutants for this screening have emissions that exceed 100 tons annually. For information, CO_2 exceeds 100 tons annually but is

not one of the criteria pollutants. In any event, a conformity determination is not required with this plan in accordance with the CAA.

(Note: The levels of fugitive dust cannot be ascertained at this time because of lack of information regarding the blasting and demolition.)

3.2.3.2.2 Plan 1B.

Similar to Plan 3, this alternative would require the use of clearing and grading equipment for the laydown area, contractor's office access road, haul roads, and disposal site. The on-land culvert would not be constructed with this alternative and would therefore require less equipment use and generate less air emissions than Plan 3. Fugitive dust created from disturbance of dry areas would be controlled by spraying water only. Construction activities for Plan 1B are estimated to last 30 months. Because the levels of activity would be less than Plan 3, a conformity determination is not required with this plan in accordance with the CAA.

(Note: The levels of fugitive dust cannot be ascertained at this time because of lack of information regarding blasting and demolition.)

3.2.3.2.3 Plan 2.

Similar to Plan 3 and 1B, this alternative would require clearing and grading for the laydown area, contractor's office access road, haul roads, and disposal site. As with Plan 1B, the on-land culvert would not be constructed with this alternative and therefore requires less excavation than Plan 3. The amount of clearing would remain approximately 30 acres in size. Construction activities for Plan 2 are estimated to last 30 months.

Equipment required for this plan is as follows:

Table ___. Plan 2 Equipment

Equipment Type	Rating	Hours
Chip Spreader	13w	1,077
Air Compressor	100 CFM	29
	250 CFM	15,440
	375 CFM	11,675
	450 CFM	53
	600 CFM	122
	900 CFM	147
	1200 CFM	1,560
Sandblaster	600 psi	590
Chainsaw	31"	643
Compactor	18.9"	112
	31.5"	351

Concrete Pump	115 cu yd /hr	80
	196 cu yd /hr	15,440
Concrete Vibrator	2.5"	30,879
	3.5"	320
	High Frequency	19
Gantry w/ Boom	100 ton	590
Crane, Hydraulic	22 ton	140
	40 ton	20
	14 ton	93
	50 ton	93
	23 ton	653
LiftCrane	150 ton	877
	450 ton	386
Crane, ME, Crawl	75 ton	10,667
	100 ton	761
Drill, Air	2.5-4"	1,560
Drill, Core	400'	203
Generator	5 KWH	38
Grader		1,546
Hydraulic Hammer	1500 Ft#	1,560
Hydraulic Excavator, Crawler	2 cu yd	391
	3.125 cu yd	919
	1.5 cu yd	1,560
Landclearer, rotary cutter	20'	975
Loader, Front End, Crawler	1.5 cu yd	1,616
	2 cu yd	122
	4 cu yd	653
	7 cu yd	2
LD/BH, Cr	1 cu yd	63
	4 cu yd	15
Pile Hammer	40 ton	38
	160 ton	121
	182 ton	877
Pump Water	6 gpm	203
Soil Comp		394
Roller	15 ton	942
Dozer, Crawler w/Blade	D7	304
	D8	540
	D9	885
Dozer, Crawler, Angletilt	D5	381
Tractor		1,663
Trencher, Walk Behind		404
Truck, dump	12 cu yd	2,833
Truck Flatbed	8x10	10

	8x12	455
	8x14	10
	8x24	25
Truck Highway	1/2 ton	280
	3/4 ton	13,154
	44300 GVW	504
	45000 GVW	162
	15000 GVW	11
	24000 GVW	203
	41000 GVW	943
	18000 GVW	241
	43000 GVW	2,686
Truck Off Highway	35 ton	6,571
Water Blaster	3000 psi	489
Welder portable	180 amp	1
	250 amp	885
	200 amp	1,264
	400 amp	310
Service Truck		2,335
Hydroseeder	1500 gal	236
Miscellaneous Power Tools		22,323
Small Tools		59,360
Power Mulcher		197
Cutting Torch		303
Floating Crane	100 ton	1,769
Tugboat	700 hp	1,490
Floating Crane	650 hp/35 ton	21
	160 ton	1,077
	200 ton	190
Tugboat	150-300 hp	1,090
Paint Sprayer		220
Drill Rig		877
Totals		**233,317**

Source: (USACE, 1999)

As shown in the previous table, a total of 233,317 hours of equipment usage is projected for this project. This is considerably less than the 305,121 hours projected for Plan 3. The emissions associated with this lower level of activity is shown in the following table:

Table ___. Plan 2 Emissions

Emissions in Tons							
	THC	**CO**	**NOx**	**SOx**	**PM**	**CO_2**	**Fugitive Dust**
Year 1	0.67	6.21	3.64	0.99	0.42	265.59	
Year 2	3.80	35.16	20.61	5.63	2.37	1,503.77	

Year 3	0.16	1.46	0.85	0.23	0.10	62.28	
Total	4.63	42.83	25.10	6.85	2.88	1,831.63	

The lower level of activity in this alternative results in fewer emissions when compared to Plan 3. As depicted in the preceding table, none of the criteria pollutants, Nitrous Oxides (NO_X) and Volatile Organic Compounds (VOCs), for this screening have emissions that exceed 100 tons annually. CO_2 exceeds 100 tons annually but is not one of the criteria pollutants. In any event, a conformity determination is not required with this plan in accordance with the CAA.

Fugitive dust would be minimized by spraying water on dry areas. (Note: The levels of fugitive dust cannot be ascertained at this time because of lack of information regarding the blasting and demolition.)

3.2.3.2.4 Plan 4.

Plan 4 involves a two-phased construction, where the first phase includes the same construction activities as Plan 2. The second phase of construction would complete the on-land culvert. As with Plan 3, clearing and dredge amounts would be approximately 30 acres and 20,000 cubic yards, respectively. Construction activities for Plan 4 are estimated to last 30 months.

Equipment required for this plan is as follows:

Table ___. Plan 4 Equipment

Equipment Type	Rating	Hours
Chip Spreader	13w	1,846
Air Compressor	100 CFM	39
	250 CFM	15,450
	375 CFM	11,695
	450 CFM	84
	600 CFM	122
	750 CFM	4,081
	900 CFM	310
	1200 CFM	1,560
Sandblaster	600 psi	993
Chainsaw	31"	986
Compactor	18.9"	112
	31.5"	351
Concrete Pump	65 cu yd /hr	11
	115 cu yd /hr	164
	196 cu yd /hr	15,440
Concrete Vibrator	2.5"	30,879
	3.5"	320
	6.0"	11

	High Freq	19
Gantry w/ Boom	100 ton	630
Crane, Hydraulic	22 ton	280
	40 ton	81
	14 ton	93
	50 ton	163
	23 ton	662
LiftCrane	150 ton	877
	450 ton	386
Crane, ME, Crawl	75 ton	10,729
	100 ton	1,158
Drill, Air	2.5-4"	5,641
Drill, Core	400'	203
Generator	5 KWH	38
Grader		1,875
Hydraulic Hammer	1500 Ft#	1,611
Hydraulic Excavator, Crawler	2 cu yd	391
	3.125 cu yd	14,453
	1.5 cu yd	1,560
Landclearer, rotary cutter	20'	975
Loader, Front End, Crawler	1.5 cu yd	1,616
	2 cu yd	122
	4 cu yd	733
	7 cu yd	2
LD/BH, Cr	1 cu yd	63
	4 cu yd	30
Pile Hammer	40 ton	38
	160 ton	376
	182 ton	877
Pump Water	6 gpm	203
Soil Comp		723
Roller	15 ton	1,710
Dozer, Crawler w/Blade	D7	354
	D8	549
	D9	980
Dozer, Crawler, Angletilt	D5	613
Tractor		1,663
Trencher, Walk Behind		404
Truck, dump	12 cu yd	2,880
Truck Flatbed	8x10	20
	8x12	1,676
	8x14	20
	8x24	50
Truck Highway	1/2 t	560

	3/4 t	13,696
	44300 GVW	1,008
	45000 GVW	202
	15000 GVW	1,252
	24000 GVW	203
	41000 GVW	1,666
	18000 GVW	241
	43000 GVW	2,708
Truck Off Highway	35 ton	53,879
Water Blaster	3000 psi	489
Welder portable	180 amp	1,212
	250 amp	885
	200 amp	1,264
	400 amp	816
Service Truck		8,103
Hydroseeder	1500 gal	236
Miscellaneous Power Tools		22,323
Small Tools		61,172
Power Mulcher		197
Cutting Torch		408
Floating Crane	100 ton	1,937
Tugboat	700 hp	1,511
Floating Crane	650 hp/35 ton	21
	160 ton	1,077
	200 ton	190
Tugboat	150-300 hp	1,090
Paint Sprayer		364
Drill Rig		2,088
Totals		322,779

Source: (USACE, 1999)

As shown in the previous table, a total of 322,779 hours of equipment usage is projected for this project. This is more than the 305,121 hours projected for Plan 3. The reason for the difference is preparation, mobilization, demobilization and finishing would have to accomplished again for the installation of the culvert. The emissions associated with this lower level of activity is shown in the following table:

Table ___. Plan 4 Emissions

Emissions in Tons							
	THC	**CO**	**NOx**	**SOx**	**PM**	**CO_2**	**Fugitive Dust**
Year 1	0.67	6.21	3.64	0.99	0.42	265.59	
Year 2	3.80	35.16	20.61	5.63	2.37	1,503.77	
Year 3	0.16	1.46	0.85	0.23	0.10	62.28	
Culvert (Later)	9.57	38.75	67.53	18.70	7.42	5,293.11	

Total	**14.20**	**81.58**	**92.63**	**25.55**	**10.30**	**7,124.75**	

The increased level of activity in this alternative results in more emissions when compared to Plan 3. As depicted in the preceding table, none of the criteria pollutants, Nitrous Oxides (NO_X) and Volatile Organic Compounds (VOCs), for this screening have emissions that exceed 100 tons annually. CO_2 exceeds 100 tons annually but is not one of the criteria pollutants. In any event, a conformity determination is not required with this plan in accordance with the CAA.

As with the other construction alternatives, water would be used to minimize fugitive dust. (Note: The levels of fugitive dust cannot be ascertained at this time because of lack of information regarding the blasting and demolition.)

3.2.3.2.5 No Action.

The no action alternative would result in the continued congestion and queuing delays during maintenance outages at Greenup locks and dam. Extended periods of queuing would lead to increased emissions and thus adversely affect the area's air quality.

3.2.3.3 Summary of Impacts

The following table lists the impacts of the five alternatives for the Greenup lock improvements project.

Table ___. Summary of Impacts

Emissions in Tons							
	THC	**CO**	**NOx**	**SOx**	**PM**	**CO_2**	**Fugitive Dust**
PLAN 3							
Year 1	2.01	11.59	13.16	3.64	1.46	1,012.69	
Year 2	11.40	65.60	74.49	20.60	8.29	5,733.90	
Year 3	0.47	2.72	3.08	0.85	0.34	237.46	
Total	**13.89**	**79.91**	**90.73**	**25.09**	**10.10**	**6,984.04**	
PLAN 1B							
Year 1	0.67	6.21	3.64	0.99	0.42	265.59	
Year 2	3.80	35.16	20.61	5.63	2.37	1,503.77	
Year 3	0.16	1.46	0.85	0.23	0.10	62.28	
Total	**4.63**	**42.83**	**25.10**	**6.85**	**2.88**	**1,831.63**	
PLAN 2							
Year 1	0.67	6.21	3.64	0.99	0.42	265.59	
Year 2	3.80	35.16	20.61	5.63	2.37	1,503.77	
Year 3	0.16	1.46	0.85	0.23	0.10	62.28	

Total	**4.63**	**42.83**	**25.10**	**6.85**	**2.88**	**1,831.63**	
PLAN 4							
Year 1	0.67	6.21	3.64	0.99	0.42	265.59	
Year 2	3.80	35.16	20.61	5.63	2.37	1,503.77	
Year 3	0.16	1.46	0.85	0.23	0.10	62.28	
Culvert (Later)	9.57	38.75	67.53	18.70	7.42	5,293.11	
Total	**14.20**	**81.58**	**92.63**	**25.55**	**10.30**	**7,124.75**	
No Action	0	0	0	0	0	0	0

As shown in the preceding table, Plans 2 and 1B would have the lowest projected construction emissions of the 4 construction alternatives. Plans 3 and 4 are very similar but the redundancy in equipment operations would result in more activity for Plan 4 and therefore higher levels of emissions. The criteria pollutants would be less than 100 tons annually for all of the construction alternatives. Therefore, the action is below the de minimis emission threshold and a conformity determination is not required.

There would be no emissions associated with construction for the No Action Alternative. But it would result in the increasing congestion and queuing delays during maintenance outages at the Greenup locks and dam. These extended periods of queuing would lead to increased emissions and a degradation of the local air quality.

3.2.4 Biological Resources

3.2.4.1 Affected Environment

3.2.4.1.1 Terrestrial.

3.2.4.1.1.1 Habitat. The Corps property adjacent to the Greenup lock and dam is characterized as northern scrub and has two areas of slightly different speciation. The area closest to the river is dominated by 10-15 year old sycamore (*Platanus occidentalis*), box elder (*Acer negundo*), and black locust (*Robina pseudo-acacia*). This community also contains a developing understory of black locust, box elder, wild black cherry (*Prunus serotina*), and silver maple (*Acer saccharinum*). Since the wooded area does not create a closed canopy, thick areas of herbaceous plants including wingstem (*Verbesina alternifolia*), Brachyelytrum (*Brachyelytrum erectum*), giant goldenrod (*Solidago gigantea*), woodland sunflower (*Helianthus divaricatus*), Virginia rye (*Elymus virginicus*), and poison ivy (*Toxicodendron radicans*) has grown. Along the shoreline between the riprap and the river, a thick bed of blunt-spike rush (*Eleocharis obtusa*) has grown.

Wild black cherry, black locust, silver maple, and sycamore dominate the area farther from the river. The open canopy allows an understory of American elm (*Ulmus americana*) and wild black cherry to develop as well as a dense layer of herbaceous cover. Areas of poison ivy, deer tongue grass (*Panicum clandestinum*) and stinging nettle (*Urtica dioica*) dominate the herbaceous cover. The community is surrounded by natural gas transmission easements and mowed fields. The border of the community contains wingstem, blackberry (*Rubus spp.*), and staghorn sumac (*Rhus typhina*).

Both wooded areas provide very little quality terrestrial habitat and no aquatic or wetland habitats. A few fallen logs may create sites for small mammals, amphibians and reptiles, but overall, the area is not conducive to diverse vertebrate communities.

There are three areas of open fields on the Corps property that have slightly different types of plant species. The first area, which is closest to the Ohio River, between the access road and riverbank is dominated by giant goldenrod, johnsongrass, and lespedeza. Black locust, sumac, and false indigo (*Amorpha fruticosa*) grows sparsely throughout this open field. The second field area is located west of the access road and also contains johnsongrass, giant goldenrod, and lespedeza; however, large patches of switchgrass (*Panicum virgatum*) have taken dominance in this area. The switchgrass clumps provide nesting and escape habitat for small mammals and birds.

The mowed fields surrounding the lock and dam maintenance facility contain common pastureland vegetation including meadow fescue (*Festuca pratensis*), red clover (*Trifolium pratense*), and orchardgrass (*Dactylis glomera*). During the warmer seasons, the area is

dominated by grease grass (*Triodia flava*), ironweed (*Vernonia gigantea*), and tickseeds (*Bidens coronata*). Table ___ lists all the species found in both the woodland areas and the open fields. Data for Section 3.2.4.1.1.1 was obtained from a vegetation survey by the Corps in September of 1998 (USACE, 1998).

Table _____. Species of Vegetation Observed on Corps Property at Greenup Lock and Dam

Herbaceous Plants	
Common Name	**Scientific Name**
Yarrow	*Achillea millefolium*
Wingstem	*Actinomerus alternifolia*
Redtop	*Agrostis alba*
Common Water Plantain	*Allisma subcordatum*
Wild Garlic	*Allium canadense*
Common Ragweed	*Ambrosia artemisifolia*
Giant Ragweed	*Ambrosia trifida*
Hog Peanut	*Amphicarpa bracteata*
Broom-Sedge	*Andropogon virginicus*
Indian hemp	*Apcynum cannabinum*
Burdock	*Arctium minus*
Milkweed	*Asclepias syriaca*
New England aster	*Aster novae-angliae*
Heath Aster	*Aster pilosus*
Aster	*Aster spp.*
Yellow Rocket	*Barbarea vulgaris*
Nodding Bur Marigold	*Bidens ceruna*
Tickseed Sunflower	*Bidens coronata*
Beggar's Tick	*Bidens frondosa*
False Nettle	*Boehmeria cylindrica*
Brachyelytrum	*Brachyelytrum erectum*
Brome Grass	*Bromus tectorum*
Trumpet Vine	*Campsis radicans*
Sheperds Purse	*Capsella bursa-pastoris*
Sedge	*Carex frankii*
Bladder Sedge	*Carex intumescens*
Wild Sensitive Plant	*Cassia fasciculata*
Lamb's Quarter	*Chenopodium album*
Chicory	*Cichorium intybus*
Thistle	*Cirsium vulgare*
Canada Thistle	*Cirsium arvense*
Virgin's Bower	*Clematis virginiana*
Poison Hemlock	*Conium maculatum*
Field Bindweed	*Convolvulus arvensis*
Hedge Bindweed	*Convolvulus sepium*

Crown Vetch	*Coronilla varia*
Galingale	*Cyperus strigosus*
Orchardgrass	*Dactylis glomerata*
Queen Anne's Lace	*Daucus carota*
Sticktight	*Desmodium spp.*
Smooth Crabgrass	*Digitaria ischaemum*
Buttonweed	*Diodia teres*
Barnyard Grass	*Echinocloa crusgalli*
Blunt Spikerush	*Eleocharis obtusa*
Goose Grass	*Eleusine indica*
Virginia Wild Rye	*Elymus virginicus*
Field Horsetail	*Equisetum arvense*
Daisy Fleabane	*Erigeron annuus*
Mistflower	*Eupatorium coelestinum*
Common Joe-pye Weed	*Eupatorium fistulosum*
Boneset	*Eupatorium perfoliatum*
White snakeroot	*Eupatorium rugosum*
Spotted Spurge	*Euphorbia maculata*
Meadow Fescue	*Festuca pratensis*
Green Ash	*Fraxinus pennsylvanica*
Cleavers	*Galium aparine*
Small-flowered Cranesbill	*Geranium pusillum*
White avens	*Geum canadense*
Ground Ivy	*Glechoma herderacea*
Cudweed	*Gnaphalium obtusifolium*
Woodland Sunflower	*Helianthus divaricatus*
Jerusalem artichoke	*Helianthus tuberosus*
Swamp Rose-Mallow	*Hibiscus moscheutos*
Spotted Jewelweed	*Impatiens capensis*
Small-flowered Morning Glory	*Ipomoea lacunosa*
Blue Lettuce	*Lactuca biennis*
Horseweed	*Lactuca canadensis*
Purple Deadnettle	*Lamium pupurea*
Wood Nettle	*Laportea canadensis*
Rice Cutgrass	*Leersia oryzoides*
Peppergrass	*Lepidium virginicum*
Lespedeza	*Lespedeza cuneata*
Great Blue Lobelia	*Lobelia siphilitica*
Italian ryegrass	*Lolium multiflorum*
Japanese Honeysuckle	*Lonicera japonica*
Water Horehound	*Lycopus americanus*
Black Medic	*Medicago lupilina*
Alfalfa	*Medicago sativa*
Yellow Sweetclover	*Melilotus officinalis*

Moonseed	*Menispermum canadense*
Common Monkey-flower	*Mimulus ringens*
Nimblewill	*Muhlenbergia schreberi*
Evening Primrose	*Oenothera biennis*
Star of Bethlehem	*Ornithogalum umbellatum*
Sweet Cicely	*Osmorhiza claytoni*
Redtop Panic-Grass	*Panicum agrostoides*
Deertongue Grass	*Panicum clandestinum*
Switchgrass	*Panicum virgatum*
Parsnip	*Pastinaca sativa*
Timothy	*Phleum pratense*
Pokeweed	*Phytolacca americana*
English Plantain	*Plantago lanceolata*
Common Plantain	*Plantago rugelii*
Smooth Solomons Seal	*Polygonatum biflorum*
Swamp Smartweed	*Polygonum coccineum*
Pennsylvania Smartweed	*Polygonum Pensylvanicum*
Wild Buckwheat	*Polygonum scandens*
Multiflora Rose	*Rosa multiflora*
Black Raspberry	*Rubus occidentalis*
Blackberry	*Rubus spp.*
Curly Dock	*Rumex crispus*
Duck Potato	*Sagittaria latifolia*
Common Elderberry	*Sambucus canadensis*
Soapwort	*Saponaria officinalis*
Soft-stem Bulrush	*Scirpus validus*
Mad-dog Skullcap	*Scutellaria lateriflora*
Yellow Foxtail	*Setaria glauca*
Green Foxtail	*Setaria viridis*
Horse Nettle	*Solanum carolinense*
Giant goldenrod	*Solidagogigantea*
Johnsongrass	*Sorghum halepense*
Prairie Cordgrass	*Spartina pectinata*
Common Chickweed	*Stellaria media*
Trailing Wild Bean	*Strophostyle helvola*
Dandelion	*Taraxacum officinale*
Tall Meadow Rue	*Thalictrum polyganum*
Penny Cress	*Thlaspi arvense*
Yellow Goatsbeard	*Tragopogon pratensis*
Tassel Rue	*Trauvetteria carolinensis*
Red Clover	*Trifolium pratense*
Grease Grass	*Triodia flava*
Narrow-leafed Cattail	*Typha angustifolia*
Stinging Nettle	*Urtica dioica*

Lamb's Lettuce	*Valerianella olitoria*
Mullein	*Verbascum thapsus*
White Vervain	*Verbena urticifolia*
Wingstem	*Verbesina alterniflora*
Ironweed	*Vernonia gigantea*
Thyme-leaved speedwell	*Veronica serpyllifolia*
Bird Vetch	*Vicia cracca*
Grape	*Vitus sp.*
Woody Plants	
Boxelder	*Acer negundo*
Silver Maple	*Acer Saccharinum*
Tree-of-Heaven	*Ailanthus altissima*
False Indigo	*Amorpha fruticosa*
Bitternut Hickory	*Carya cordiformis*
Shellbark Hickory	*Carya laciniosa*
Black Walnut	*Julgans nigra*
Tulip Poplar	*Liriodendron tulipifera*
White Mulberry	*Morus Alba*
American Sycamore	*Platanus occidentalis*
Cottonwood	*Populus deltoides*
Wild Black Cherry	*Prunus serotina*
Chinquapin Oak	*Quercus muehlenbergii*
Black Oak	*Quercus velutina*
Staghorn Sumac	*Rhus typhina*
Black Locust	*Robina pseudo-acacia*
Sandbar Willow	*Salix interior*
Black Willow	*Salix nigra*
Poison Ivy	*Toxicodendron radicans*
American elm	*Ulmus americana*

Source: USACE, 1998; B&NL, 1999

3.2.4.1.1.2 Wildlife. The Corps property along the Ohio River is used by numerous migratory and resident bird species as well as ground animals. Table ____ lists the bird species found in the lock and dam area. Table ____ lists the mammal, reptile and amphibian species found in the proposed construction site area at the locks and dam. The tables also note the habitat that each species prefers.

Table . Birds in the Greenup Lock and Dam Area		
Common Name	**Scientific Name**	**Habitat**
Redwing Blackbird	*Agelaius phoeniceus*	Open field
Mallard Duck	*Anas platyrhynchos*	Woods
Ruby-throated Hummingbird	*Archilochus colubris*	Woods/shore

Cedar Waxwing	*Bombycilla cedrorum*	Woods
Canada Goose	*Branta canadensis*	Shore/open field
Red-tailed Hawk	*Buteo jamaicensis*	Open field
Green Heron	*Butorides striatus*	Woods
Cardinal	*Cardinalis cardinalis*	Woods
Turkey Buzzard	*Cathartes aura*	Open field
Killdeer	*Charadrius vociferous*	Open field
Yellow-shafted Flicker	*Colaptes auratus*	Open field
Common Crow	*Corvus brachyrhynchos*	Shore
Blue Jay	*Cyanocitta cristata*	Woods
Pileated Woodpecker	*Dryocopus pileatus*	Woods
Catbird	*Dumatella carolinensis*	Woods
American Coot	*Fulica americana*	Shore
Common Yellowthroat	*Geothlypis trichas*	Woods
Barn Swallow	*Hirundo rustica*	Open field
Wood Thrush	*Hylocichla mustelina*	Woods
Baltimore Oriole	*Icterus galbula*	Open field
Belted Kingfisher	*Magaceryle alcyon*	Open field/ shore
Song Sparrow	*Melospiza meldia*	Open field/woods
Great Crested Flycatcher	*Myarchis crinitus*	Woods/shore
Tufted titmouse	*Parus bicolor*	Woods
Indigo Bunting	*Passerina cyanea*	Woods
Double Crested Cormorant	*Phalacrocorax auritus*	Shore
Hairy Woodpecker	*Picoides villosus*	Woods
Rufous-sided Towhee	*Pipilo erythrophthalmus*	Woods
Purple Martin	*Progne subis*	Open field
Common Grackle	*Quiscalus quiscula*	Woods
Redstart	*Setophaga ruticilla*	Woods
Eastern Bluebird	*Sialia sialia*	Open field
Meadow Lark	*Sturnelaa magna*	Open field
Starling	*Sturnus vulgaris*	Open field
Carolina Wren	*Thryothorus ludovicianus*	Woods
Brown Thrasher	*Toxostoma rufum*	Woods
American Robin	*Turdus migratorius*	Woods
Mourning Dove	*Zenaida macroura*	Open field

Source: (B&NL, 1999)

Table . Mammals, Reptiles and Amphibians in the Greenup Lock and Dam Area

Common Name	Scientific Name	Habitat
Short-tailed Shrew	*Blarina brevicauda*	Open Field
Beaver	*Castor canadensis*	Shore
Opossum	*Didelphis virginiana*	Woods

Big Brown Bat	*Eptesicus fuscus*	Woods
Woodchuck	*Marmota monax*	Open field
Meadow Vole	*Microtus pennsylvanicus*	Open field
Whitetail Deer	*Odocoileus virginianus*	Woods
Deer Mouse	*Peromyscus maniculatus*	Woods
Raccoon	*Procyon lotor*	Woods/shore
Eastern Harvest Mouse	*Reithrodontomys humulis*	Open field
Eastern Chipmunk	*Tamias striatus*	Woods
Red Fox	*Vulpes vulpes*	Shore
Eastern Painted Turtle	*Chrysemys picta picta*	Shore
Eastern Box Turtle	*Terrapene carolina carolina*	Woods

Source: (B&NL, 1999)

3.2.4.1.2 Aquatic.

3.2.4.1.2.1 Habitat. The aquatic habitat in the Greenup lock and dam area includes two riverine zones and a simulated backwater area, which is created by the lock structures. The area found between the 340.5 mile marker to the upstream end of the lock walls contains a sand and silt substrate with a steep vegetated bank at the shoreline. The riparian zone at this portion of the river contains undercut banks, root wads, root mats and overhanging vegetation. This type of habitat is favorable cover for juvenile fish species.

The backwater pool area occurs directly north and south of the lock facilities. This area is dominated by a fine silt sediment. The shoreline in the pool area is lined with riprap and overhanging vegetation. Again, the vegetation provides adequate cover for fish, including juvenile stages. The shallow shoreline areas are approximately 5 feet deep, whereas up to 20 feet can be found approximately 6 meters from shore.

The habitat found between mile markers 341.5 and 343 contains various mixtures of clay, cobble, silt, sand and gravel, where less fine silt sediment and more cobble occurs farther downstream of the locks and dam. The shoreline contains mostly cobble and sand with remnants of past dredge disposal. Water depth in this area ranged from 5 ft at the shoreline to approximately 11 ft, 6 meters from the shore. Information contained in this section was obtained from an aquatic inventory conducted by Burgess & Niple, Limited in May of 1999 (BN&L, 1999).

3.2.4.1.2.2 Wildlife. A wide variety of fish and invertebrates utilize the Greenup locks and dam area. No mussels were found within one half mile upstream of the dam or within one mile downstream of the dam. Between mile markers 342 and 343, a narrow mussel bed was found within 50 meters of the Kentucky shore (BN&L, 1999). The mussel species identified are listed in Table _____. Macroinvertebrate species found throughout the 2.5 mile inventory are listed in Table _____.

Table . Mussel Species in the Greenup Lock and Dam Area	
Common Name	**Scientific Name**
Mucket	*Actinonaias ligamentina*
Threeridge	*Amblema p.plicata*
Butterfly	*Ellipsaria lineolata*
Elephant-ear	*Elliptio crassidens*
Spike	*Elliptio dilatata*
Ebonyshell	*Fusconaia ebena*
Wabash Lake pigtoe	*Fusconaia flava*
Plain Pocketbook	*Lampsilis cardium*
Pocketbook	*Lampsilis ovata*
Fatmucket	*Lampsilis siliquoidea*
Fragile papershell	*Leptodea fragilis*
Black Sandshell	*Ligumia recta*
Washboard	*Megalonaias nervosa*
Threehorn	*Obliquaria reflexa*
Ring Pink	*Obovaria retusa*
Sheep Nose	*Plethobasus cyphyus*
Ohio River pigtoe	*Pleurobema cordatum*
Pink heelsplitter	*Potamilus alatus*
Monkeyface	*Quadrula metanevra*
White Wartyback	*Quadrula nodulata*
Pimpleback	*Quadrula p. pustulosa*
Mapleleaf	*Quadrula quadrula*
Fawnsfoot	*Truncilla donaciformis*
Deertoe	*Truncilla truncata*

Source: B&NL, 1999

Table . Macroinvertebrate Species in the Greenup Lock and Dam Area	
Common Name	**Scientific Name**
Zebra Mussel	*Dreissena polymorpha*
Asian Clam	*Corbicula fluminea*
Oligochaete	*Lumbriculus variegatus*
Oligochaete	*Branchiura sowerbyi*
Mayfly	*Hexagenia sp.*
Limpet	*Ferrissia rivularis*
Amphipod	*Gammarus fasciatus*
Oligochaete	*Pristina breviseta*
Midge	*Ablabesmyia sp.*
Midge	*Tanytarsus sp.*
Midge	*Dicrotendipes sp.*
Midge	*Thienemannimyia sp.*

Midge	*Paratanytarsus sp.*
Midge	*Macropelopia sp.*
Midge	*Polypedilum sp.*
Midge	*Parachironomus sp.*
Midge	*Eukiefferiella sp.*
Midge	*Cricotopus sp.*

Source: B&NL, 1999

The following table provides a list of fish species found in the Greenup Pool and Meldahl Pool. The Greenup Pool is upstream of the locks and dam and extends from river mile marker 279.75 to 341. The Meldahl Pool is downstream of the locks and dam and extends from river mile marker 341.45 to 436.2. Species found only in the Greenup pool are indicated by (*); species found only in the Meldahl Pool are indicated by (**).

Table X.X Fish Species of the Greenup Lock Area, Including the Greenup and Meldahl Pools

Common Name	Scientific Name
Bluegill	*Lepomis macrochirus*
Bluegill X Longear Sunfish*	*Lepomis macrochirus x megalotis*
Freshwater Drum	*Aplodinotus grunniens*
Longnose Gar	*Lepisosteus osseus*
Bowfin*	*Amia calva*
Gizzard Shad	*Dorosoma cepedianum*
Threadfin Shad	*Dorosoma petenense*
Mimic Shiner	*Notropis volucellus*
Shorthead Redhorse	*Moxostoma macrolepidotum*
Golden Redhorse	*Moxostoma erythrurum*
Silver Redhorse*	*Moxostoma anisurum*
Black Redhorse*	*Moxostoma duquesnei*
River Redhorse*	*Moxostoma carinatum*
Smallmouth Buffalo	*Ictiobus bubalus*
Black Buffalo*	*Ictiobus niger*
Bigmouth Buffalo**	*Ictiobus cyprinellus*
Channel Catfish	*Ictalurus punctatus*
Flathead Catfish	*Pylodictis olivaris*
Blue Catfish**	*Ictalurus furcatus*
Sauger	*Stizostedion canadense*
Green Sunfish	*Lepomis cyanellus*
Redear Sunfish*	*Lepomis microlophus*
Longear Sunfish	*Lepomis megalotis*
Orangespotted Sunfish*	*Lepomis humilis*
Carp	*Cyprinus carpio*
Carp X Goldfish*	*Cyprinus carpio x auratus*
Pumpkinseed	*Lepomis gibbosus*

Warmouth**	*Lepomis Gulosus*
Shortnose Gar**	*Lepisosteus platostomus*
Muskellunge**	*Esox masquinongy*
Smallmouth Bass	*Micropterus dolomieu*
Largemouth Bass	*Micropterus salmoides*
Spotted Bass	*Micropterus punctulatus*
White Bass	*Morone chrysops*
Striped Bass	*Morone saxatilis*
Rock Bass	*Ambloplites rupestris*
Yellow Bass**	*Morone mississippiensis*
Logperch	*Percina caprodes*
Banded Darter	*Etheostoma zonale*
Dusky Darter	*Percina sciera*
Channel Darter	*Percina copelandi*
Slenderhead Darter	*Percina phoxocephala*
Orangethroat Darter*	*Etheostoma spectabile*
River Darter	*Percina shumardi*
Greenside Darter*	*Etheostoma blennioides*
Johnny Darter*	*Etheostoma nigrum*
Saugeye	*Stizostedion canadense x vitreum*
Morone spp.	*Morone spp.*
Notropis spp.	*Notropis spp.*
Cyprinidae spp.	*Cyprinidae spp.*
Carpiodes spp.	*Carpiodes spp.*
Fathead Minnow	*Pimephales promelas*
Bluntnose Minnow	*Pimephales notatus*
Bullhead Minnow*	*Pimephales vigilax*
Skipjack Herring	*Alosa chrysochloris*
Mooneye	*Hiodon tergisus*
River Carpsucker	*Carpiodes carpio*
Quillback Carpsucker	*Carpiodes cyprinus*
Highfin Carpsucker	*Carpiodes velifer*
Emerald Shiner	*Notropis atherinoides*
Sand Shiner	*Notropis stramineus*
River Shiner*	*Notropis blennius*
Spottail Shiner*	*Notropis hudsonius*
Spotfin Shiner*	*Notropis spilopterus*
Steelcolor Shiner**	*Cyprinella whipplei*
Channel Shiner**	*Notropis wickliffi*
Black Crappie	*Pomoxis nigromaculatus*
White Crappie	*Pomoxis annularis*
Silver Chub	*Macrhybopsis storeriana*
Hybrid Striper	*Morone saxatilis x chrysops*
Northern Hog Sucker*	*Hypentelium nigricans*

White Sucker*	*Catostomus commersoni*
Walleye	*Stizostedion vitreum*
Spotted Sucker	*Minytrema melanops*
Carpiodes/Ictiobus	*Carpiodes/Ictiobus*
Goldfish*	*Carassius auratus*
Silver Lamprey*	*Ichthyomyzon unicuspis*
Chestnut Lamprey**	*Ichthyomyzon castaneus*
Brook Silverside*	*Labidesthes sicculus*
Paddlefish	*Polyodon spathula*
American Eel**	*Anguilla rostrata*
Central Stoneroller	*Campostoma anomalum*

Sources: (ORSANCO, 1995); (ORSANCO, 1997); (B&NL, 1999); (ODNR, 1999); (ODNR, 1994)

3.2.4.1.3 Threatened, Endangered and Other Protected Species. No Federally threatened or endangered species, including terrestrial and aquatic species exist in the Greenup lock and dam area (B&NL, 1999). However, the pocketbook mussel, which is a Kentucky endangered species, the sheepnose mussel, which is a Kentucky species of concern, were collected live in this area. The shell of a ring pink mussel, which is a Kentucky endangered species, was collected and indicates that live individuals may be in the area (BN&L, 1999).

The riverbank paspalum (*Paspalum fluitans*) is listed as an Ohio state potentially threatened plant species and may occur approximately two miles downstream of the lock, but was not found at the construction site (ODNR, 1999) (BN&L, 1999). Table ____ lists the Ohio state threatened, endangered and special interest fish species potentially occurring in the lock and dam area.

Table . Ohio State Listed Fish Species in the Greenup Lock and Dam Area

Common Name	Scientific Name	State Status
Shortnose Gar	Lepisosteus platostomus	Endangered
Goldeye	Hiodon alosoides	Endangered
Silver Lamprey	Ichthyomyzon unicuspis	Threatened
River Redhorse	Moxostoma carinatum	Special Interest
Muskellunge	Esox masquinongy	Special Interest
Mooneye	Hiodon tergisus	Special Interest

Source: ODNR, 1999

Table . Kentucky State Listed Fish Species in the Greenup Lock and Dam Area

Common Name	Scientific Name	State Status
Johnny Darter	*Etheostoma nigra susanae*	Threatened

Chestnut Lamprey	*Ichthyomyzon castaneus*	Special Interest
Black Buffalo	*Ictiobus niger*	Special Interest
Spottail Shiner	*Notropis hudsonius*	Special Interest

Source: (KSNPC, 1999a)

In addition, the trout-perch (*Percopsis omiscomaycus*) is a Kentucky species of special concern that may occur in the Greenup pool; however, the last known observation of this species in the lock and dam area occurred in 1905 (KSNPC, 1999).

3.2.4.1.4 Wetlands. A 0.1 acre wetland habitat is located near the gas transmission maintenance facility, which is on the Corps property. The wetland is located adjacent to the proposed spoil disposal site. It is approximately 200 feet north of the sharp eastward turn in the access road on the edge of the woodland habitat. It contains numerous wetland vegetation species including rice cut-grass (*Leersia oryzoides*), boneset (*Eupatorium perfoliatum*), narrowleaf cat-tail (*Typha angustifolia*), water plantain (*Allisma subcordatum*), and arrowleaf (*Sagittaria latifolia*) (USACE, 1998). The inventory team identified wetland drainage patterns as well as desiccated vegetation, which confirmed the area's classification as a wetland. Another wetland is located ¼ mile from the Ohio River mainstem in an unnamed embayment off of Chandlers Run, which is ¼ mile upstream of the Greenup lock and dam. This wetland is approximately 500 ft long and 100 ft wide.

3.2.4.1.5 Floodplains. The 100-year floodplain of the Ohio River is shown in gray on Figure _____. The Corps property at the lock and dam is located on both the floodway and the floodplain. However, the spoil disposal site is found only on floodplain area and does not impact the floodway.

Floodway: The channel of a river or stream and the adjacent land that must be reserved to discharge flood waters (CDWR, 1999).
Floodplain: The lowland that borders a stream or river and is found outside of the floodway. It is usually dry, but subject to flooding (NDWP, 1999).

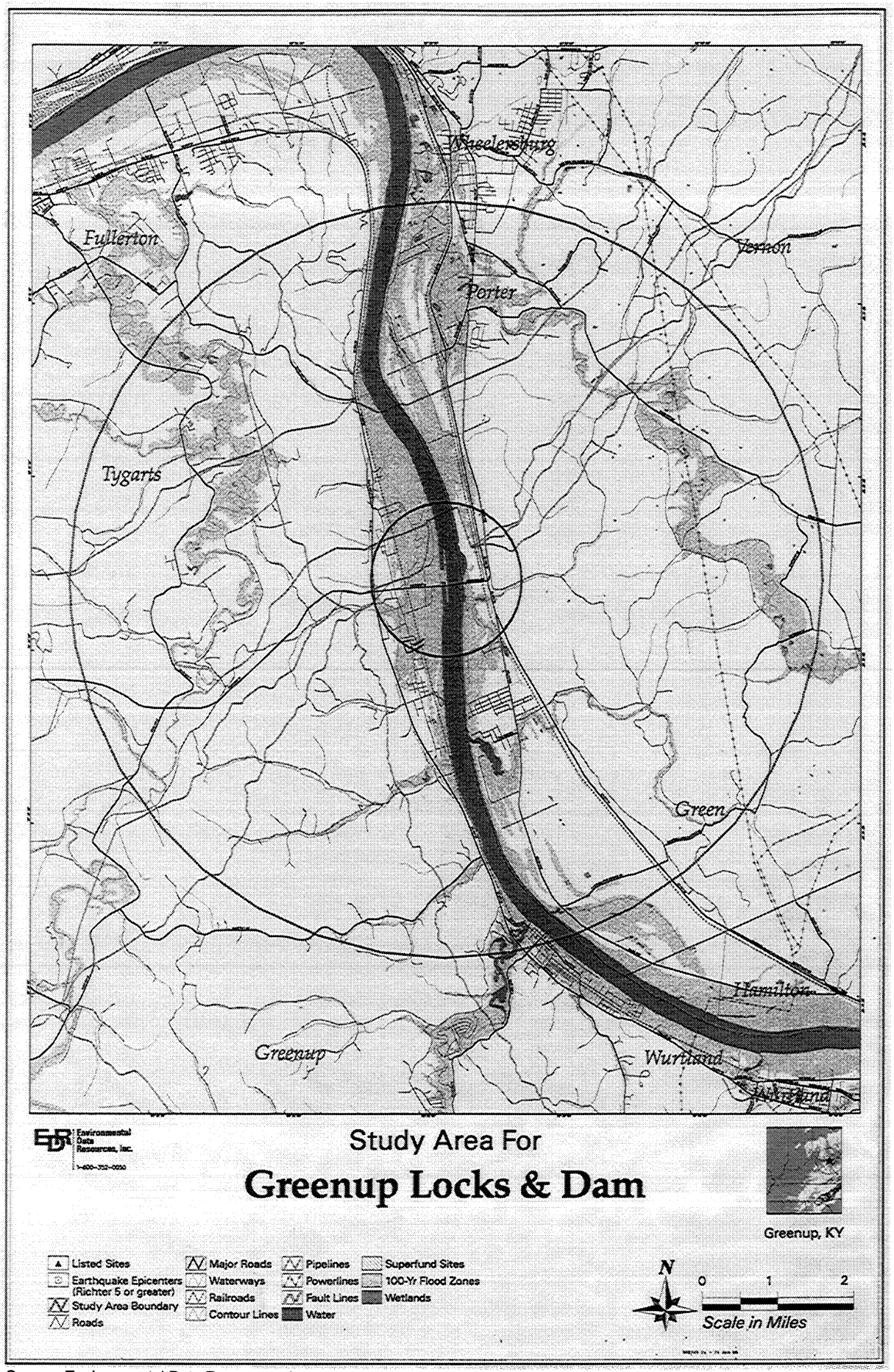
3.2.4.1.6 Islands. There are no islands in the Greenup lock and dam area.

3.2.4.2 Environmental Consequences

3.2.4.2.1 Plan 3.

The potential impacts of the construction and operation of the lock extension and additional fill/empty system include:

- Damage to vegetation and wildlife from clearing for spoil disposal, access roads, and laydown areas;



Source: Environmental Data Resources, Inc.

Figure _____ Greenup Locks and Dam Study Area

- Damage to vegetation and aquatic biota from sedimentation and erosion during construction activities, especially downstream;
- Damage to vegetation and wildlife from hazardous, toxic, or radioactive waste from spoil disposal;
- Damage to vegetation and wildlife (including aquatic) from accidental spills;
- Damage to vegetation and wildlife from controlled burning;
- Displace wildlife during clearing and grading;
- Disturb/displace wildlife from noise generated during construction activities;
- Harm aquatic biota from noise and vibration created during controlled blasting;
- Harm aquatic biota, specifically benthic species from turbidity and release of contaminants during excavation and periodic maintenance dredging;
- Loss of habitat or wetlands from creation of spoil disposal site;
- Change floodplain hydrology from a rise in elevation at disposal site;
- Harm aquatic biota from construction of mooring structures, increased mooring activities, and removal of mooring structures;
- Create new habitat for sessile aquatic biota on new mooring structures;

The construction of the lock extension would require the clearing of various portions of the vegetated areas on the Corps property as well as require dredging and excavation in the Ohio River. Dredging temporarily increases turbidity and suspended solids as well as releases any contaminants that may be found in the sediments (USAEWES, 1993). The entire Greenup construction site and adjacent properties have been investigated for potential hazardous, toxic, and radioactive waste (HTRW) and no parcel of land contained any HTRW concerns. Benthic communities that feed by filtering microorganisms out of the water including the macroinvertebrates would be harmed by the increased sediment in the water column (USAEWES, 1993). Turbidity would be minimized by use of a turbidity curtain, which would surround the construction area. The turbidity curtain would not impede traffic though the main 1200 ft lock chamber. The mussel bed located approximately 1.5 miles downstream of the locks and dam may be impacted by the increased sediment in the water column. However, depending on the flow velocity of the river, sediments that are stirred up during construction may settle out prior to reaching the mussel bed. The turbidity curtain would also minimize impacts to the mussel bed.

Approximately 20,000 cu yd of dredge material would be spoiled on-site, therefore, 5-10 acres of vegetation would be cleared to create a spoil disposal site. The proposed access road to the contractor's office would require 2 acres of clearing and the haul roads would require 3 acres of vegetation clearing. An additional 15 acres of vegetation would be cleared for the proposed laydown area. None of the vegetation species identified on the Corps property are unique, rare or protected species. The vegetation does not provide critical habitat to any threatened or endangered species. The local area may experience a lower species population since wildlife using the vegetation and habitat on the cleared portion may not be able to establish new habitat adjacent to the construction site. Small mammals, amphibians and reptiles making use of fallen logs would lose their habitat when the area is cleared for spoil disposal. Birds using the woodland area for either permanent or temporary migratory residence would need to find alternate roosting habitat. The woodland, open field and riparian habitats that are cleared during

construction would be replaced with new equivalent habitats in nearby locations. The Corps would fund the revegetation as compensation for the lost habitats.

The dredged material for spoil disposal would be piled at a maximum of 10 ft high on the disposal site. The new elevation of material would not affect the 100-year floodplain and would not disturb the floodway zone.

An erosion control plan would be developed by the construction contractor and must be approved by the Corps prior to construction activities. The erosion control plan would include sedimentation and erosion control measures to protect the wetland, surrounding vegetation and the aquatic habitats both upstream and downstream of the lock. For example, silt fencing would be used around the spoil disposal site and any other disturbed areas. The wetland located adjacent to the spoil disposal site would receive runoff from the site which may cause ponding in the wetland if the drainage and plant uptake is not sufficient. The wetland located in the embayment of Chandler's Run may be affected by the construction activities; however, due to its upstream tributary position and the turbidity control measures taken by the Corps, impacts would be minimized.

The Corps would develop boulder/cobble habitats downstream of the locks and dam as mitigation for any loss of aquatic habitats during construction. Dikes ranging in size from 3 to 1000 ft with graveled edges for mussel habitation are distinct possibilities; however, exact quantities and locations are not yet determined. Vegetated shallows in the nearby embayments upstream of the lock and dam may be developed in order to compensate for the disturbance of upstream habitats.

Construction of the lock extension would increase barge queuing in the area and create turbidity and damage to shoreline habitats if barges were to run aground in order to wait for lock passage. The Corps would install floating mooring buoys that would restrict queuing tows to the navigation channel and would reduce the impacts to mussel beds, spawning bars, and other benthic communities. The new floating buoys would create a substrate for algae to grow, which would provide a food source for invertebrate aquatic organisms.

Cleared trees and scrap wood products would be burned in the spoil area on an intermittent basis over a 3-month period of time. The Corps would obtain a state permit to conduct the burning and would follow all applicable state and local regulations. The ash and residue from the burning would be left in place and covered by dredged material over time. Accidental spills would be handled in accordance with the control and disposal plan, which is developed by the construction contractor. The control and disposal plan must comply with EPA standards and procedures and must be submitted to the Corps for approval. No additional impacts to vegetation or wildlife from controlled burning or accidental spills are predicted by the study team.

The construction activities would generate noise both above ground and underwater, which would disturb the terrestrial and aquatic wildlife. Terrestrial animals would be startled from the construction site. These individuals may or may not become established in the new location; therefore, a localized reduction in species populations may occur. Controlled blasting would be used to demolish monoliths on the upstream and downstream ends of the land wall during

construction. Blasting in or near water produces shock waves that can cause a critical reduction in water pressure, which damages the swim bladder, kidneys, liver, spleen, and sinus venosus of fish, often resulting in their death (MLI, 1999). Blasting vibrations may also kill or damage fish eggs and larvae (MLI, 1999). Kentucky and Ohio State threatened, endangered and special interest fish species may be harmed by these construction activities. Minimal fish kills are expected; however, by use of controlled blasting techniques, where large charges are divided into a series of smaller charges in several different blasting holes, the impact would be greatly reduced as opposed to the use of one large blast. The multiple smaller blasts would absorb the shockwave and reduce the vibration of the blast significantly. Monetary compensation would be provided to the state for any game fish individuals that are lost during blasting activities. Minimal amounts of stocking may also be conducted by the Corps to mitigate for fish losses.

3.2.4.2.2 Plan 1B. Similar to Plan 3, this alternative would require clearing and grading for the laydown area, contractor's office access road, haul roads, and disposal site. The area to be cleared would remain a total of approximately 30 acres with about 20,000 cu yd dredged material being disposed of on site. Since the land culvert would not be constructed with this alternative, less excavation and land disturbance would occur. As mentioned in Section 3.2.4.2.1, the vegetation species at the lock and dam site are not unique, rare or protected. The wildlife utilizing the habitat would be lost as a result of the construction activities. As with Plan 3, the woodland and open field habitats would be replaced as well as any riparian habitats that are lost during construction.

An erosion control plan would be developed by the construction contractor and would require Corps approval prior to use. The same mitigation measures would be conducted as with Plan 3 to compensate for any losses of habitat or animals. As with Plan 3, floating mooring buoys would be installed to keep barges from grounding on the shoreline during queuing. The buoys would reduce impacts to mussel beds and benthic communities in the area. Turbidity in the construction area would be minimized by the use of a turbidity curtain.

Cleared trees and wood scraps would be burned in accordance with the Kentucky state burning regulations. Accidental spills would be handled in accordance with the control and disposal plan, which complies with EPA standards.

The controlled blasting techniques used for Plan 3 would also be used for Plan 1B. As discussed in Section 3.2.4.2.1, fish kills would be expected; however, with the reduced shockwave and vibration from the controlled blasting techniques, the aquatic impacts would be minimal. Monetary compensation would be given to the state for any game fish that are lost.

3.2.4.2.3 Plan 2. The impacts to vegetation and wildlife caused by Plan 2 would be the same as the impacts discussed in Plan 3 and Plan 1B. The on-land culvert would not be constructed with this alternative and would therefore requires less excavation and land disturbance than Plan 3. The amount of clearing would remain approximately 30 acres in size and any birds or ground animals using that area would temporarily relocate or be lost.

Woodland, open field, and riparian habitat areas would be replaced in other locations to compensate for this loss.

Controls on erosion and turbidity would be used for Plan 2 in the same manner as Plan 3. Similarly, controlled blasting techniques would be necessary and would follow blasting plan specifications to reduce shockwaves and vibration. Minimal fish kills are expected as with Plan 3 and monetary compensation would be given to the state for any lost game fish species. Controlled burning would follow applicable state regulations and accidental spills would be handled in accordance with EPA standards.

3.2.4.2.4 Plan 4. The impacts to vegetation and wildlife caused by Plan 4 would also be the same as Plan 3; however, the impacts would occur in two stages. The first phase of construction is the same as the development in Plan 2, which would not include the construction of the on-land culvert. The culvert would be constructed in the future when needed.

As with Plan 3, clearing and dredge amounts would be approximately 30 acres and 20,000 cu yd, respectively. However, since the on-land culvert would not be built for several years, less excavation and land disturbance would occur upfront in this first phase of construction. Erosion from the spoil disposal site and all disturbed areas would be controlled by silt fencing and hay bales. The habitats that are cleared for the construction would be replaced in other locations to compensate for the loss of vegetation and wildlife.

3.2.4.2.5 No Action. The no action alternative would result in the continued congestion and queueing delays during maintenance outages at Greenup lock and dam. Barges would continue to be grounded on shorelines to wait for lock passage, which causes direct damage to the shoreline and creates increased turbidity and suspended solids in the water column. The turbidity would harm benthic communities by hindering the filter feeding process.

3.2.4.3 Summary of Impacts

The following table lists the impacts of the five alternatives for the Greenup lock improvements project.

Summary of Impacts	
Alternative	**Impacts**
Plan 3	• 30 acres of vegetation cleared • Loss of habitat for birds and ground animals • Increased turbidity in the river harming benthic species • Controlled blasting harming fish • Runoff and ponding in small wetland adjacent to disposal site • Positive impact to benthic communities from use of floating mooring buoys
Plan 1B	• 30 acres of vegetation cleared • Loss of habitat for birds and ground animals • Increased turbidity in the river harming benthic species • Controlled blasting harming fish • Runoff and ponding in small wetland adjacent to disposal site • Positive impact to benthic communities from use of floating mooring buoys
Plan 2	• 30 acres of vegetation cleared • Loss of habitat for birds and ground animals • Increased turbidity in the river harming benthic species • Controlled blasting harming fish • Runoff and ponding in small wetland adjacent to disposal site • Positive impact to benthic communities from use of floating mooring buoys
Plan 4	• 30 acres of vegetation cleared • Loss of habitat for birds and ground animals • Increased turbidity in the river harming benthic species • Controlled blasting harming fish • Runoff and ponding in small wetland adjacent to disposal site • Positive impact to benthic communities from use of floating mooring buoys
No Action	• Continued or increased congestion causing high turbidity and shoreline damage from grounded idling barges

3.2.6 Noise

Noise can be annoying or disruptive to normal activities for people and wildlife. In extreme cases, it can have health effects, such as hearing loss. The pattern (location, duration, timing and frequency) of activities gives rise to a pattern of noise.

The loudest sounds that can be detected comfortably by the human ear have intensities that are 1,000,000,000,000 times larger than those of sounds that can just be detected. Because of this vast range, any attempt to represent the intensity of sound using a linear scale becomes very unwieldy. As a result, a logarithmic unit known as the decibel (dB) is used to represent the intensity of a sound. Such a representation is called a sound level. The loudness of sound as heard by the human ear is measured on the A-weighted decibel (dBA) scale. Normal speech has a sound level of approximately 60 dBA. Sound levels above about 120 dBA begin to be felt inside the human ear as discomfort and eventually pain at still higher levels. (DOD, 1978) Examples can be found in the following table:

Table ___. Common Noise Levels

Source	Decibel Level	Exposure Concern
Soft Whisper	30	Normal safe levels.
Quiet Office	40	
Average Home	50	
Conversational Speech	66	
Busy Traffic	75	May affect hearing in some individuals depending on sensitivity, exposure length, etc.
Noisy Restaurant	80	
Average Factory	80-90	
Pneumatic Drill	100	Continued exposure to noise over 90 dB may eventually cause hearing impairment
Automobile Horn	120	
Jet Plane	140	Noises at or over 140 dB may cause pain
Gunshot Blast	140	

Source: (EPA, 1986)

Certain land uses, facilities, and the people associated with them are more sensitive to a given level of noise than other uses. Such "sensitive receptors" include schools, churches, hospitals, retirement homes, campgrounds, wilderness areas, hiking trails, and some species of threatened or endangered wildlife. Recommended land use and associated noise levels are illustrated in the following table.

Table ___. Recommended Land Use Noise Levels				
Land Use Category	**Noise Levels**			
	Clearly Acceptable	**Normally Acceptable**	**Normally Unacceptable**	**Clearly Unacceptable**
Residential	< 60	60-65	65-75	> 75
Commercial, Retail	< 65	65-75	75-80	> 85
Commercial, Wholesale	< 70	70-80	80-85	> 85
Manufacturing	< 55	55-70	70-80	> 80
Agricultural, Animal Breeding	< 60	60-75	75-80	> 80
Agricultural, Farming	< 75	> 75		
Natural Recreation Areas	< 60	60-75	75-85	> 85
Hospitals	< 60	60-65	65-75	> 75
Schools	< 60	60-65	65-75	> 75
Libraries	< 60	60-65	65-75	> 75
Churches	< 60	60-65	65-75	> 75
Nursing Homes	< 60	60-65	65-75	> 75
Playgrounds	< 55	55-65	65-75	> 75

Source: (HUD, 1991)

3.2.6.1 Affected Environment

The area surrounding the Greenup Lock and Dam is one predominately rural in nature. The land use is predominately agricultural. The nearest sensitive noise receptors, a day care center and a school, are approximately 5,000 feet from the construction center.

(Note: It is unknown at this time the nearest residences to the construction site.)

3.2.6.2 Environmental Consequences

3.2.6.2.1 Plan 3.

The potential impacts of the construction and operation of the lock extension and additional fill/empty system include:

- Disturb/displace wildlife from noise created during the construction activities associated with the lock extension and related areas;
- Disturb residents from noise created during the construction activities associated with the lock extension and related areas; and
- Decrease noise on river by reducing queuing during lock outages.

The construction of the lock extension would require the clearing of various portions of the vegetated areas on the Corps property as well as require dredging and excavation in the Ohio River. Approximately 5-10 acres of vegetation would be cleared to create a spoil disposal site. The proposed access road to the contractor's office would require 2 acres of clearing and the haul roads would require 3 acres of vegetation clearing. An additional 15 acres of vegetation would be cleared for the proposed laydown area. Controlled blasting would be used to demolish monoliths on the upstream and downstream ends of the land wall during construction.

Construction Equipment required for this plan is as follows:

Table ___. Plan 3 Equipment

Equipment Type	Rating	Hours
Chip Spreader	13w	1,077
Air Compressor	100 CFM	38
	250 CFM	15,450
	375 CFM	11,675
	450 CFM	84
	600 CFM	122
	750 CFM	94
	900 CFM	276
	1200 CFM	1,560
Sandblaster	600 psi	858
Chainsaw	31"	643
Compactor	18.9"	112
	31.5"	351
Concrete Pump	65 CY/hr	11
	115 CY/hr	164
	196 CY/hr	15,440
Concrete Vibrator	2.5"	30,879
	3.5"	320
	6.0"	11
	High Frequency	19
Gantry w/ Boom	100 ton	630
Crane, Hydraulic	22 ton	140
	40 ton	61
	14 ton	93
	50 ton	93
	23 ton	653
LiftCrane	150 ton	877
	450 ton	386
Crane, ME, Crawl	75 ton	10,730
	100 ton	1,158
Drill, Air	2.5-4"	1,654

Drill, Core	400'	203
Generator	5 kWh	38
Grader		1,550
Hydraulic Hammer	1500 Ft#	1,584
Hydraulic Excavator, Crawler	2 CY	391
	3.125 CY	14,303
	1.5 CY	1,560
Landclearer, rotary cutter	20' cut	975
Loader, Front End, Crawler	1.5 CY	1,616
	2 CY	122
	4 CY	724
	7 CY	2
LD/BH, Crawler	1 CY	471
	4 CY	15
Pile Hammer	40 ton	120
	160 ton	376
	182 ton	877
Pump Water	6 gpm	203
Soil Compactor		394
Roller	15 ton	1,078
Dozer, Crawler w/Blade	D7	304
	D8	540
	D9	885
Dozer, Crawler, Angletilt	D5	381
Tractor		1,663
Trencher, Walk Behind		404
Truck, dump	12 CY	2,833
Truck Flatbed	8x10	10
	8x12	1,666
	8x14	10
	8x24	25
Truck Highway	1/2 ton	260
	3/4 ton	13,144
	44300 GVW	504
	45000 GVW	162
	15000 GVW	1,222
	24000 GVW	203
	41000 GVW	943
	18000 GVW	241
	43000 GVW	2,686
Truck Off Highway	35 ton	52,575
Water Blaster	3000 psi	489
Welder portable	180 amp	1,212
	250 amp	885

	200 amp	1,264
	400 amp	818
Service Truck		5,855
Hydroseeder	1500 gal	236
Miscellaneous Power Tools		22,323
Small Tools		60,238
Power Mulcher		197
Cutting Torch		406
Floating Crane	100 ton	1,937
Tugboat	700 hp	1,511
Floating Crane	650 hp/35 ton	1,098
	160 ton	0
	200 ton	0
Tugboat	150-300 hp	1,280
Paint Sprayer		362
Drill Rig		2,088
Totals		**305,121**

(Source: USACE, 1999)

As shown in the Table XX, a total of 305,121 hours of equipment usage is projected for this project. A schedule of construction phases had to be assessed to determine the type and amount of equipment that would be used at the same time. This was necessary in order to determine the maximum level of equipment use at one time. From this it was possible to estimate the maximum level of noise for the site. The following table depicts the items of equipment assumed for the analysis.

Table ___. Equipment Utilization for Noise Analysis

Equipment Type	Number	Noise (dBA)
Cranes	2	91.0
Scrapers	2	89.0
Dozers	2	90.0
Front End Loaders	2	93.0
Backhoes	2	88.0
Graders	2	88.0
Air Compressors	6	89.0
Pumps	3	80.0
Heavy Off Road Trucks	12	78.0
Total Noise (see text box)		**101.15**

The U. S. Department of Transportation's Federal Highway Administration Highway Construction Noise methodology was used for assessing the noise for this analysis. The analysis assumed each of the above pieces of equipment would be operated at the same time at a normal operations tempo. As a result, the total amount of noise generated with all of this equipment operating at the same time would be 101.15 dBA. (See text box.)

Noise decreases over distance. For a point source of noise, the sound level decreases by 6 dB for every doubling of distance from the source. (DOD, 1978) As a result, the nearest sensitive noise receptor, a day care center and a nursing home, approximately 5,000 feet away, would experience a noise level of 61 dBA. As indicated in Table XX, this is within the "normally acceptable" level of noise for the nursing home, the day care center and even a playground potentially associated with the day care center. Although the levels of construction noise would disturb wildlife near to the construction site, the levels of noise should not be enough to harm them. Finally, after the construction is completed, the extended lock would decrease queuing and therefore reduce noise on the river.

Total Noise Computations

Because of the logarithmic nature of the decibel (dB) unit, sound levels cannot be added or subtracted directly. However, there are some simple rules of thumb. First, if a sound intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example:

60 dB + 60 dB = 63 dB

and

80 dB + 80 dB = 83 dB.

The total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60 dB + 70 dB = 70.4 dB.

Because the addition of sound levels behaves differently than that of ordinary numbers, such addition is often referred to as "decibel addition."

(DOD, 1978)

(Note: The levels of noise associated with blasting cannot be ascertained at this time because of lack of information.)

3.2.6.2.2 Plan 1B.

Similar to Plan 3, this alternative would require clearing and grading for the laydown area, contractor's office access road, haul roads, and disposal site. The area to be cleared would remain a total of approximately 30 acres. The on-land culvert would not be constructed with this alternative. Therefore, the levels of construction activity would be less and the noise levels associated with this alternative would be less than Plan 3. Construction activities for Plan 1B are estimated to last 30 months. A controlled blasting plan would be submitted for approval by the Corps. The plan would include a detailed description of the methods and equipment used for each operation and the sequence of operations. (Note: The levels of noise associated with blasting cannot be ascertained at this time because of lack of information.)

3.2.6.2.3 Plan 2.

For the purposes of this resource area, this alternative is essentially the same as Plan 1B. It would require clearing and grading for the laydown area, contractor's office access road, haul roads, and disposal site as with the other construction alternatives. As with Plan 1B, the on-land culvert would not be constructed with this alternative, therefore the levels of activity would be less and the noise levels associated with this alternative would be less than Plan 3.
The area to be cleared would remain a total of approximately 30 acres. As with the other construction alternatives, a controlled blasting plan would be submitted for approval by the Corps. The plan would dictate specific procedures and equipment needed for the demolition of monoliths. (Note: The levels of noise associated with blasting cannot be ascertained at this time because of lack of information). Construction activities for Plan 1B are estimated to last 30 months.

3.2.6.2.4 Plan 4.

The first phase of construction of Plan 4 is the same as the development in Plan 2, which would not include the construction of the on-land culvert. The second phase of construction would be to complete the culvert. Since the culvert would not be built for several years, less excavation would occur in this first phase of construction. Clearing and dredge amounts would still be approximately 30 acres and 20,000 cu yards, respectively. The existing access road would be still be used as the main road to access the construction site and a contractor's access road and fisherman access road would need to be constructed. A detailed blasting plan would include a description of the methods and equipment used for each operation and the sequence of those operations. (Note: The levels of noise associated with blasting cannot be ascertained at this time because of lack of information). Construction activities for Plan 4 are estimated to last 30 months.

Because the levels of equipment activity are similar to Plan 1B and Plan 2, the noise levels during the first phase of the construction would be less than Plan 3. There would, however be an additional phase of construction associated with the installation of the on-land culvert. The level of effort here; however, is still less than the peak levels associated with Plan 3.

3.2.6.2.5 No Action.

The no action alternative would result in the continued congestion and queuing delays during maintenance outages at Greenup lock and dam. Continued extended periods of queuing would lead to increased noise levels along the river.

3.2.6.3 Summary of Impacts

The following table lists the impacts of the five alternatives for the Greenup lock and dam improvements project.

Table ___. Summary of Impacts	
Alternative	**Impacts**
Plan 3	• Noise level of 101.15 dBA for Construction • Noise level of 61 dBA for nearest noise sensitive receptor. • Noise level may cause temporary disruption but not harm wildlife. • The construction of the lock extension would decrease queuing and therefore reduce noise on the river (Note: Blast/demolition noise levels unknown for lack of information.)
Plan 1B	• Construction Noise less than 101.15 dBA of Plan 3 • Noise level for nearest sensitive receptor less than 61 dBA. • Noise level may cause temporary disruption but not harm wildlife. • The construction of the lock extension would decrease queuing and therefore reduce noise on the river (Note: Blast/demolition noise levels unknown for lack of information.)
Plan 2	• Construction Noise less than 101.15 dBA of Plan 3 • Noise level for nearest sensitive receptor less than 61 dBA. • Noise level may cause temporary disruption but not harm wildlife. • The construction of the lock extension would decrease queuing and therefore reduce noise on the river (Note: Blast/demolition noise levels unknown for lack of information.)
Plan 4	• Construction Noise less than 101.15 dBA of Plan 3 • Additional construction phase for the installation of the on-land culvert would still be less than Plan 3. • Noise level for nearest sensitive receptor less than 61 dBA. • Noise level may cause temporary disruption but not harm wildlife. • The construction of the lock extension would decrease queuing and therefore reduce noise on the river (Note: Blast/demolition noise levels unknown for lack of information.)
No Action	• Continued extended periods of queuing would lead to increased noise levels along the river.

3.2.7 Human Health and Safety

3.2.7.1 Affected Environment

The Greenup lock and dam property is open to the public for picnicing and observation. There is an observation tower overlooking the locks where many signs are posted restricting the public from unsafe areas. Chain link fencing surrounds the lock chambers and Corps personnel are present at the lock at all times. Recreational boaters are not permitted past the lock approach walls in either direction for safety purposes.

3.2.7.2 Environmental Consequences

3.2.7.2.1 Plan 3

The potential impacts from Plan 3 on human health and safety are:

- Degrade human health and safety from the risk of spills during construction activities and increased queuing;
- Degrade human health and safety during transportation of pre-cast sections/material's; and
- Degrade human health and safety from the storage of materials;

During lock construction, several safety procedures would be in place. A notice of construction activities would be given to the navigation industry, helper boats would be used to assist navigation traffic, dive plans and blasting plans would be submitted, the contractor would coordinate construction activities with the lockmaster, the contractor would have on-site safety personnel and EM 385-1-1, Safety and Health Requirements Manual, U.S. Army Corps of Engineers would be enforced.

To help prevent harm to workers or the public from accidental spills during construction, a control and disposal plan would be in effect. As stated throughout this EIS, this plan would include procedures for addressing filling and disposal of hydraulic oil, manner of draining pipe, disposition of valves, pipe and other related construction debris, manner of collection and storage of used or split oil, manner of collection, storage and disposal of used absorbent or absorbent pads. The contractor would provide records to confirm that work was done in the approved manner.

As stated in Section 3.2.7.2.1, preparation of the lock sections would take place at R.C. Byrd dry dock. Pre-cast sections for the approach wall would be floated from R.C. Byrd to Greenup lock. The pre-cast sections for the land and middle walls will be transported from the riverbank at Greenup on the downstream end by a floating crane. All transportation operations would take place in accordance with EM 385-1-1 Safety and Health Requirements. Within 30 days from the date of notice to proceed, the plan for transporting material and equipment to the work site would

be submitted. The plan would indicate haul routes, method of transportation, safety precautions and method of handling and storage (DA, 1993). Materials kept on the construction site would be stored in accordance with manufacturer's instructions as well as EM 385-1-1 Safety and Health Requirements (DA, 1993).

The main concerns during the blasting process are possible damage to the gas line located along the western edge of the Corps property and harming the existing lock. The contractor would submit a proposed plan for drilling and blasting of rock for Corps approval. This plan would show the location and depth of holes, inclination of wedge cut holes, amount and strength of explosives per hole and per round, sequence of firing and time delays, and estimated length of pull per blast. All work would be done in accordance with EM 385-1-1, Safety and Health Requirements Manual and applicable State and Federal regulations. All blasting operations would be subject for approval by the Corps to ensure the safety of workers and the public during demolition of monoliths. This plan would also address the required communication, coordination and monitoring efforts between the contractor, the contracting officer and the lockmaster regarding the impacts of the blasting on navigation and day to day operation of the existing locks and dam.

Between 4-12 blasts using less than one pound of explosives per cubic yard of concrete would be required for the demolition. Sufficient delays would be installed to minimize the blasting vibration. The plan would include a detailed description of the methods and equipment used for each operation and the sequence of operations. These procedures would provide a safe conduct of the work, removal and disposition of materials to be salvaged, protection of property which is to remain undisturbed and coordination with any other work in progress.

Navigation would be restricted during blasting for safety purposes. There are 2 existing mooring cells located upstream from Greenup locks and dam that could be used as a means of mooring the queue during construction. Construction work limits (CWL's) would be marked with bobbers, both upstream and downstream, for the safety of both the construction workers and boaters. The lock construction activities would not cause harm to either the workers or the public.

Temporary fencing would be required on all projects located in areas of active use by members of the public and any construction work. In accordance with EM 385-1-1 Safety and Health Requirements, signs warning of the presence of construction hazards requiring unauthorized persons to keep out of the construction area would be posted on the fencing. At the minimum, posting would be on all fences sides of the project and spaces one sign every 300 feet. For areas of minimal public exposure, fencing is not required but signs, warning of construction hazards, would be posted. Signs would be provided where needed to regulate traffic, warn of hazardous conditions, and establish restrictions and restricted areas and to direct and inform the public. Informational signs and bulletin boards would be provided in the public use and observation areas containing project maps, emergency numbers, Title 36-Parks, Forests and Public Property- rules and regulations, safety tips and general information on the history, purpose and operation of the facility. The fencing and signage would minimize the risk of harm to the public during construction.

Disposal of all construction materials, effluent, and other wastes would be handled in accordance with EM 385-1-1 Safety and Health Requirements. Any materials that might be burned throughout the construction process (i.e. cleared trees and shrubs), would follow the measures outlined in 401 Kentucky Administrative Regulation (KAR) 63:005 Open Burning. Strict adherence to these regulations would prevent harm to construction workers and the public.

All diving performed under the proposed action would be in strict accordance with the rules and regulations prescribed by the Department of Labor; Occupational Safety and Health Administration (OSHA), as per Commercial Diving Operations; Part 1910 of Title 29 of the Code of Federal Regulations, Subpart T; the USACE Safety and Health Requirements Manual, EM 385-1-1; Corps of Engineers Diving Regulations and ER 385-1-86. All diving activities would be conducted with full knowledge and close coordination with the Contracting Officer and Lockmaster. Divers would not enter the water or move from the prescribed location without the approval of the Lockmaster and the Contracting Officer.

The policies, procedures and regulations established as operating standards for the Plan 3 lock extension would minimize or prevent harm to workers and the public.

3.2.7.2.2 Plan 1B. As discussed in Plan 3, several safety procedures would be in place throughout the construction activities. A notice of construction activities would be given to the navigation industry, helper boats would be used to assist navigation traffic, dive and blasting plans would be submitted, the contractor would coordinate construction activities with the lockmaster, the contractor would have on-site safety personnel and EM 385-1-1, Safety and Health Requirements Manual, U.S. Army Corps of Engineers would be enforced.

Similar to Plan 3, a control and disposal plan would be in effect on the construction site to prevent harm to workers and the public from an accidental spill. Preparation of the lock sections would take place at R.C. Byrd dry dock. All safety measures as outline in Plan 3 would be followed.

The contractor would submit a proposed plan for drilling and blasting of rock for approval. All work would be done in accordance with EM 385-1-1, Safety and Health Requirements Manual and applicable State and Federal regulations. Provided all measures outlined in the plan are followed, harm to workers and the public would be minimized.

Because navigation would be restricted during blasting for safety purposes and CWL's would be marked with bobbers, both upstream and downstream harm to workers and the public is lessened.

As stated in Plan 3, temporary fencing and warning signs would be required on all projects located in areas of active use by members of the public and any construction work. Disposal of all construction materials, effluent, and other wastes would be handled in accordance with EM 385-1-1 Safety and Health Requirements. Any materials that might be burned throughout the construction process would follow the measures outlined in 401 Kentucky Administrative

Regulation (KAR) 63:005 Open Burning. If these measures are followed, harm to workers and the public is minimized.

All diving performed under the proposed action would be in strict accordance with pertinent rules and regulations. All diving activities would be conducted with full knowledge and close coordination with the Contracting Officer and Lockmaster. Divers would not enter the water or move from the prescribed location without the approval of the Lockmaster and the Contracting Officer.

3.2.7.2.3 Plan 2. As outlined in Plan 3, and Plan 1B, several safety measures would be enforced. To minimize the harm to workers and the public from accidental spills during construction, a control and disposal plan would be in effect.

As with Plan 3 and Plan 1B, preparation of the lock extension sections would take place at R.C. Byrd dry dock. All transportation operations would take place in accordance with EM 385-1-1 Safety and Health Requirements. Materials kept on the construction site would be stored in accordance with manufacturer's instructions as well as EM 385-1-1 Safety and Health Requirements (DA, 1993).

The contractor would submit a proposed plan for drilling and blasting of rock for approval. All work would be done in accordance with EM 385-1-1, Safety and Health Requirements Manual and applicable State and Federal regulations. Provided all these measures are adhered to, harm to workers and the public would be minimized.

As in Plan 3 and Plan 1B, navigation would be restricted during blasting for safety purposes and CWL's would be marked with bobbers, both upstream and downstream. Therefore, harm to workers and the public would be reduced or eliminated.

Temporary fencing and signs would be required on all projects located in areas of active use by members of the public and any construction work. Disposal of all construction materials, effluent, and other wastes would be handled in accordance with EM 385-1-1 Safety and Health Requirements. Any materials that might be burned throughout the construction process would follow the measures outlined in 401 Kentucky Administrative Regulation (KAR) 63:005 Open Burning.

All diving performed under the proposed action would be in strict accordance with rules and regulations pertinent to diving. All diving activities would be conducted with full knowledge and close coordination with the Contracting Officer and Lockmaster. Divers would not enter the water or move from the prescribed location without the approval of the Lockmaster and the Contracting Officer.

The policies, procedures and regulations established as operating standards for the Plan 2 lock extension would minimize or prevent harm to workers and the public.

3.2.7.2.4 Plan 4. Several safety measures would be enforced throughout construction activities as outlined in the previous alternatives. Dive and blasting plans, as well as activity

notices and navigation aids would each contribute to the protection of both the workers and public.

To prevent injury from accidental spills during construction, a control and disposal plan would be in effect. As stated previously, this plan would include procedures for addressing the collection and disposal of waste and construction materials

The R.C. Byrd dry dock would be used in the same manner as Plan 3, 1B and 2. All transportation operations would take place in accordance with EM 385-1-1 Safety and Health Requirements.

Materials kept on the construction site would be stored in accordance with manufacturer's instructions as well as EM 385-1-1 Safety and Health Requirements (DA, 1993).

The contractor would submit a proposed plan for drilling and blasting of rock for approval. All work would be done in accordance with EM 385-1-1, Safety and Health Requirements Manual and applicable State and Federal regulations. All blasting operations would be subject for approval by the USACE to ensure the safety of workers and the public during demolition of monoliths. This plan would also address the required communication, coordination and monitoring efforts between the contractor, the contracting officer and the lockmaster regarding the impacts of the blasting on navigation and day to day operation of the existing locks and dam.

Navigation would be restricted during blasting for safety purposes. There are 2 existing mooring cells located upstream from Greenup lock and dam that could be used as a means of mooring the queue during construction. CWL's would be marked with bobbers, both upstream and downstream, for the safety of both the construction workers and boaters.

Temporary fencing would be required on all projects located in areas of active use by members of the public and in areas of any construction work. Signs of warning of the presence of construction hazards requiring unauthorized persons to keep out of the construction area shall be posted on the fencing. For areas of minimal public exposure, fencing is not required but signs, warning of construction hazards, shall be posted. Signs would be provided where needed to regulate traffic, warn of hazardous conditions, and establish restrictions and restricted areas and to direct and inform the public. Informational signs and bulletin boards would also be provided. The fencing and signage would minimize any impacts to human health and safety.

Disposal of all construction materials, effluent, and other wastes would be handled in accordance with EM 385-1-1 Safety and Health Requirements. Any materials that might be burned throughout the construction process (i.e. cleared trees and shrubs), would follow the measures outlined in 401 Kentucky Administrative Regulation (KAR) 63:005 Open Burning.

All diving performed under the proposed action would be in strict accordance with rules and regulations pertaining to diving. All diving activities would be conducted with full knowledge and close coordination with the Contracting Officer and Lockmaster. Divers would not enter the water or move from the prescribed location without the approval of the Lockmaster and the Contracting Officer.

As with the other 3 construction alternatives, adherence to the policies and procedures established for the lock extension would prevent or minimize any harm to the workers and the public.

3.2.7.2.5 No Action. The no action alternative would result in continued or increased barge congestion and queuing during maintenance operations. Traffic congestion could lead to increased hazards for recreational boaters.

3.2.7.3 Summary of Impacts

Table --. Summary of Impacts on Human Health and Safety

Alternative	Impacts
Plan 3	• Risk to construction workers and public during blasting activities • Risk to divers during construction activities
Plan 1B	• Risk to construction workers and public during blasting activities • Risk to divers during construction activities
Plan 2	• Risk to construction workers and public during blasting activities • Risk to divers during construction activities
Plan 4	• Risk to construction workers and public during blasting activities • Risk to divers during construction activities
No Action	• Increased congestion could cause harm to recreational boaters

3.2.10 Socioeconomic Resources

3.2.10.1 Affected Environment

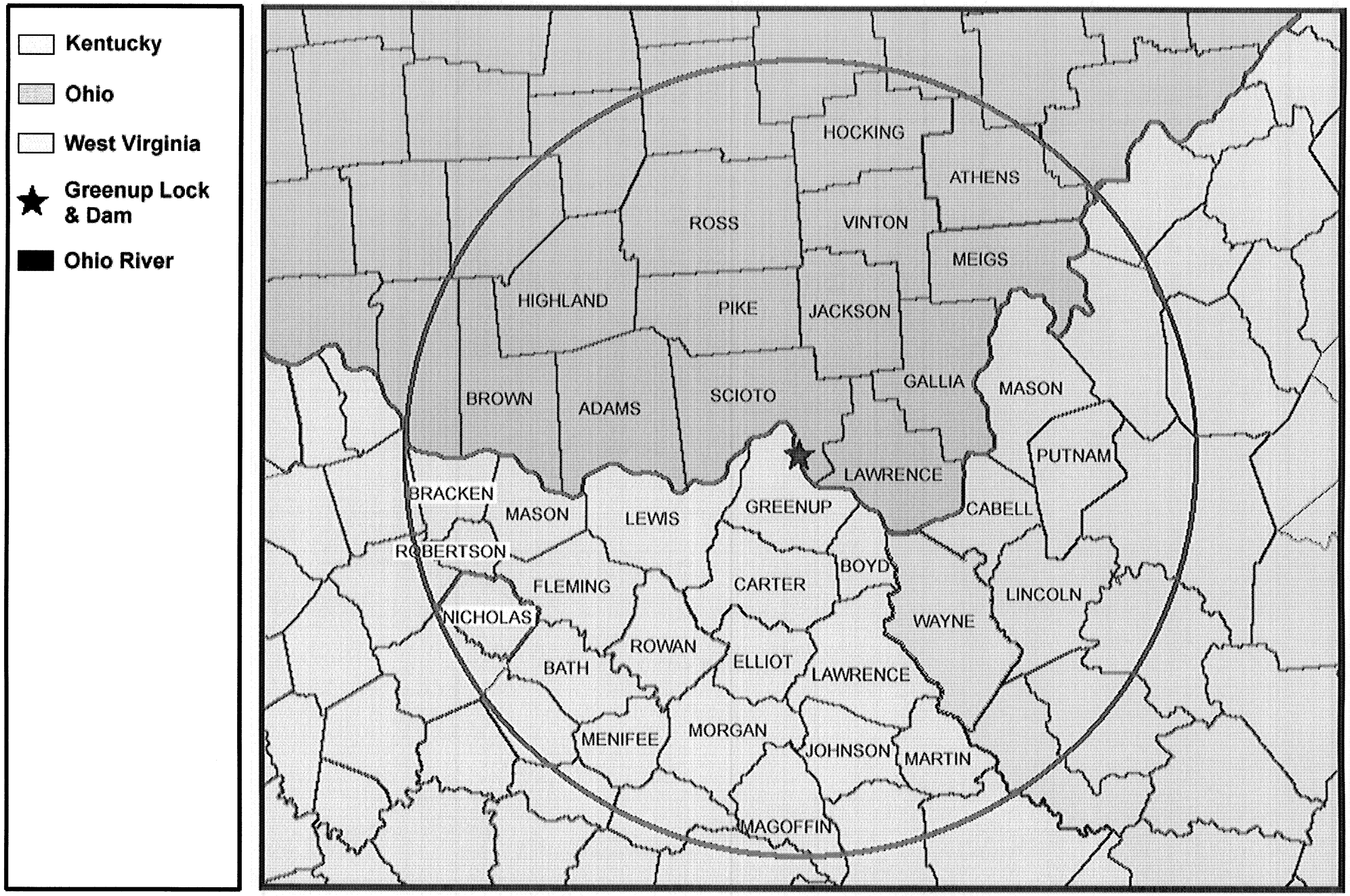
The affected environment for the construction of the Greenup lock improvements project includes Greenup County, Kentucky and may include other surrounding counties in Kentucky, Ohio, and West Virginia. These counties are as follows (see Figure X.X):

Kentucky: Lewis, Boyd, Carter, Lawrence, Elliot, Mason, Bracken, Robertson, Fleming, Nicholas, Rowan, Bath, Menifee, Morgan, Magoffin, Johnson, and Martin.

West Virginia: Wayne, Cabell, Lincoln, Putnam, Mason, and Jackson.

Ohio: Scioto, Lawrence, Adams, Brown, Gallia, Meigs, Jackson, Pike, Athens, Vinton, Hocking, Highland, and Ross.

In 1998, there were 4,176 contracted construction jobs in Greenup (KDES, 1999b). In the Five County Area Development District (FIVCO ADD), which includes Greenup, Carter, Elliot, Boyd, and Lawrence counties, 45% of unemployed laborers have worked in the construction industry (CKY, 1998). Greenup County consists of predominantly agricultural communities. In addition to agriculture other economic activities include contracted construction (5.2% of all industry), manufacturing (22.3%), transportation and utilities (4.6%), wholesale and retail trade (28.2%), finance/insurance/real estate (4.0%), and public and private services (17.1%) (KDES, 1999b). The median household income for Greenup in 1996 was $29,527 (USCB, 1996a). Table X.X provides socioeconomic information for the counties in the FIVCO ADD that would be affected by the lock improvements project.



Source: AirSpace Manager Spectrum Sciences & Software, Inc.

Figure: Counties within a 75-mile radius of Greenup Lock and Dam

Table X-X Socioeconomic Information for the Five County Area					
County, KY (Population)	Per Capita Income	Top Economic Activities	Number of Farms	% Land as Farms	% Poverty
Greenup (36,874)	$17,400	Wholesale/Retail Trade, Manufacturing, Private Services	733	43	17.8
Boyd (49,543)	$18,661	Wholesale/Retail Trade, Private Services, Manufacturing	207	21	16.9
Carter (26,848)	$12,229	Wholesale/Retail Trade, Manufacturing, Private Services	872	39	27.1
Elliot (6,602)	$9,307	State/Local Gov't, Private Services, Wholesale/Retail Trade	439	36	32.1
Lawrence (15,647)	$11,643	Wholesale/Retail Trade, State/Local Gov't, Private Services	297	19	30.9

Sources: (USCB, 1996d); (USCB, 1996e); (USDA, 1997)

In April 1999, the rate of unemployment in Greenup County was 5.6%, or 929 out of a total workforce of 16,690 (KDES, 1999a). In 1999, unemployment rates for surrounding Lewis, Carter, and Boyd counties in Kentucky were estimated to be 12.3%, 12.1%, and 6.4%, respectively (KDES, 1999a). In comparison, the national unemployment rate for May 1999 was 4.2% (Crutsinger, 1999). **Table X.X** provides employment data for counties that occur within a 75-mile radius of the Greenup locks and dam. Counties with approximately greater than 75% of their area occurring in this 75-mile radius were included in the study (see Figure **X.X**). These "employment pool" counties were considered because of their location within an acceptable distance for perspective employees to commute to the construction site.

TABLE X-X. 1999 Employment Data for Surrounding Counties			
County	Workforce	% Unemployment	Available Workforce
Kentucky[1]			
Greenup	16,690	5.6	929
Lewis	4,852	12.3	595
Boyd	22,984	6.4	1,481
Carter	11,809	12.1	1,426
Lawrence	5,336	10.3	549
Elliot	2,913	12.8	373
Mason	8377	2.8	236

County	Workforce	% Unemployment	Available Workforce
Kentucky Cont.			
Bracken	3753	3.4	128
Robertson	990	5.1	50
Fleming	5807	4.1	237
Nicholas	3137	3.5	109
Rowan	9,218	3.5	321
Bath	5,604	6.2	345
Menifee	2,771	6.4	177
Morgan	4,963	7.2	357
Magoffin	5,063	12.5	635
Johnson	9,772	6.8	665
Martin	2,813	13.3	37
West Virginia[2]			
Wayne	17,250	6.7	1,150
Cabell	43,890	5.2	2,290
Lincoln	7,020	11.6	810
Putnam	26,050	5.2	1,360
Mason	9,080	14.1	1,280
Jackson	13,440	7.0	940
Ohio[3]			
Scioto	32,500	8.5	2,800
Lawrence	27,200	5.8	1,600
Adams	11,200	9.2	1,000
Brown	19,900	4.8	1,000
Gallia	14,800	9.0	1,300
Meigs	8,500	11.7	1,000
Jackson	14,400	8.2	1,200
Pike	12,000	9.3	1,100
Athens	27,500	4.4	1,200
Vinton	3,900	11.5	500
Hocking	12,300	5.5	700
Highland	19,200	4.2	800
Ross	35,700	5.1	1,800

Sources: [1](KDES, 1999a); [2](WVBEP, 1999); [3](OBES, 1999)

3.2.10.2 Environmental Consequences

3.2.10.2.1 Plan 3.

The potential socioeconomic impacts from Plan 3 are:

- Create employment through need for construction workers;
- Generate temporary local income and revenue as a result of increased employment;
- Economic loss as a result of possible damage to outside structures after blasting events (for demolition of monoliths);
- Loss of local revenue as a result of recreation exclusion during construction;
- Economic constraint as a result of limits placed on recreational activities post construction; and
- Decrease in operation costs for idling barges as a result of decreased ship congestion.

For the purpose of this discussion, employment estimates have been determined as full time equivalent jobs. Full-time equivalents (FTEs) were determined by dividing total project work hours by total annual billable hours (1,920), based on a full twelve-month year. Throughout this section, any references to jobs/workers are based on FTEs. It has been estimated that a maximum of 191 jobs and a total worker income of approximately $14.2 million (loaded labor rate) would be created from this three-year construction project. At a minimum, 39, 191, and 14 jobs would be created for the first, second, and third years of construction, respectively.

It is anticipated that the majority of the workers would be local hires drawn from the surrounding counties. However, the precise number of the workers for the Greenup lock improvement project that would be hired from just Greenup County as opposed to surrounding counties cannot be predicted. Construction workers would most likely commute daily to the site. The need for temporary residences near the construction site for workers from more distant locations is not anticipated. Large population centers, populations exceeding 250,000 people, within 150 miles of the project area that could potentially provide workers include, Lexington, Kentucky (405,936); Cincinnati, Ohio (1,526,090); Columbus, Ohio (1,345,450); Huntington, West Virginia (312,529); and Charleston, West Virginia (250,454) (USCB, 1996c).

This increase in employment may lead to a temporary increase in local revenue in Greenup and surrounding counties during the three-year construction period. The creation of construction jobs may reduce the high rates of unemployment and poverty in Greenup and surrounding counties. As shown in Tables X.X and X.X., there is an abundant workforce available to accommodate the Greenup lock improvements and any other additional construction projects that may arise before the commencement of the project. However, workers would not be needed until the year 2007 when the construction would commence. During this time, unemployment rates are subject to fluctuation and may be dramatically different from current rates by the time the project starts and workers are hired. The Corps would conduct a more complete socioeconomic analysis closer to the commencement of the project in order to reevaluate impacts using more current unemployment and available workforce data.

The project is not expected to cause an overall population growth from new residents moving into Greenup County. Because the construction jobs are temporary and no new permanent jobs would be created, the need for additional housing, additional utilities, and additional social services such as ambulance service, classrooms, teachers, and police and fire protection are not anticipated. The action would result in a temporary inflow of funds to the area, in the form of expenditures of surplus income at locally owned establishments. Following the construction project, no additional workers would be required; the current staff is sufficient to operate the existing and improved locks.

Low level blasting would be used for the rock excavation and concrete demolition. In order to alleviate, and possibly eliminate, (1) damage to surrounding structures from demolition and (2) an economic loss during blasting events (demolition of monoliths); accelerometers would be placed on nearby structures to measure acceleration and detect vibrations. The specifications for blasting will also limit the peak particle velocity (speed) and ground acceleration of the blasts.

Recreation exclusions and limitations during construction and post construction could inhibit local revenue gain because it would eliminate the need for equipment and supplies for certain recreational activities, for example fishing gear, licenses, bait, or boat rentals.

The improvements to the Greenup lock would also reduce the idling of barges during queuing. One of the goals of the improvement project is to do away with unnecessary ship congestion. With the reduction of barge idling, operation costs of those barges would be reduced as well.

3.2.10.2.3 Plan 1B.

The potential socioeconomic impacts from Plan 1B are similar to those discussed in Plan 3.

3.2.10.2.3 Plan 2.

The potential socioeconomic impacts from Plan 2 are similar to those discussed in Plan 3.

3.2.10.2.4 Plan 4.

The potential socioeconomic impacts from Plan 4 are similar to those discussed in Plan 3.

3.2.10.2.5 No Action.

The potential socioeconomic impacts from the No Action Alternative are:

- Neither positive nor negative impacts on the employment rate and local income; and
- Continued, and a possible increase in, operation costs for idling barges as a result of ship congestion.

The No Action Alternative would not create temporary construction jobs over a two to three-year period and would not contribute to the local economy. Unemployment rates would not be affected.

Operation costs for idling barges would continue, and could perhaps increase with the growth of business and industry in the coming years. The continued operation costs of the idling of barges would also place constraints on the economy, since the shipping industry would eventually pass those additional costs on to the consumer.

3.2.10.3 Summary of Impacts

Table X-X Summary of Impacts

Alternative	Impacts
Plan 3	• Creation of temporary employment • Temporary increase in local income and revenue • Economic loss due to possible damage from blasting • Loss of local revenue due to recreational constraints • Decrease in operation costs for barges • Decrease ship congestion
Plan 1B	• Creation of temporary employment • Temporary increase in local income and revenue • Economic loss due to possible damage from blasting • Loss of local revenue due to recreational constraints • Decrease in operation costs for barges • Decrease ship congestion
Plan 2	• Creation of temporary employment • Temporary increase in local income and revenue • Economic loss due to possible damage from blasting • Loss of local revenue due to recreational constraints • Decrease in operation costs for barges • Decrease ship congestion
Plan 4	• Creation of temporary employment • Temporary increase in local income and revenue • Economic loss due to possible damage from blasting • Loss of local revenue due to recreational constraints • Decrease in operation costs for barges • Decrease ship congestion
No Action	• No creation of temporary employment • Increase in operation costs for barges

3.2.11 Environmental Justice

According to Executive Order 12898, each federal agency must conduct its programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under, such programs, policies, and activities, because of their race, color, national origin, or income level. Agencies must ensure that disproportionately adverse effects are not being imposed on minority or low-income areas by Federal actions.

All four construction alternatives would not cause adverse environmental impacts to any of the residents of Greenup County and Scioto County, regardless of race, national origin, or level of income. Disproportionately adverse effects to minority or low-income individuals are not possible. Therefore, the USACE has satisfied the requirements of the Environmental Justice Executive Order 12898.

The No Action Alternative would not cause significant environmental impacts to any of the residents of Greenup or Scioto Counties, regardless of race, national origin, or level of income. The lock operations would continue as they currently do and there would be no violation to Executive Order 12898.

Protection of Children from Environmental Health Risks and Safety Risks

Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, directs federal agencies to "identify and assess environmental health risks and safety risks that may disproportionately affect children." Executive Order 13045 requires federal agencies to "ensure that [their] policies, programs, activities, and standards address disproportionate risks to children that result" from these risks, as well. Based on a review of relevant data to date, the five alternatives do not appear to result in environmental health or safety risks that disproportionately affect children. For example, as described in Section 3.2.7, safety measures would prevent children from entering the construction site.

3.2.14 Recreation

3.2.14.1 Affected Environment

The Ohio River is used extensively for a variety of recreational activities. Currently there are no public advisories or restrictions on recreational activities exist on the Ohio River (ORSANCO, 1999). However, the Kentucky Department of Natural Resources and the Ohio Department of Health have both issued fish consumption advisories for fishermen in areas where polychlorinated biphenyls (PCB) are found (KDNR, 1999) (ODH, 1999). Hunting and camping are restricted on the Greenup lock and dam property. Signs restricting these activities are posted on the property.

The Ohio Department of Natural Resources, Division of Wildlife, Wildlife District Four, compiled a list of game fish per river pool (per county) along the Ohio border of the Ohio River. The Greenup pool and Meldahl pool together encompass the Greenup lock and dam; the data from these pools are listed in **Table X.X** (ODNR, 1999b).

Table X.X Game Fish of the Ohio River Including Greenup and Meldahl Pools
Channel Catfish
Flathead Catfish
Crappie/Sunfish
Largemouth Bass
Spotted Bass
Smallmouth Bass
Hybrid Striped Bass
White Bass
Sauger
Walleye
Striped Bass** (Meldahl Pool only)
Saugeye
Freshwater Drum
Carp
Other (gar, suckers, bowfin, buffalofishes, skipjack, mooneye, and goldeye)

Source: (ODNR, 1999b); (ODNR, 1996)

From 1992-1993, the Ohio Department of Natural Resources, Division of Wildlife conducted a study entitled the Ohio River Recreational Use Survey. Of the 32 locations surveyed along the Ohio River in 1992 for this study, the Greenup tailwater had the highest number of total angler hours, which was 179,568 hours. Total angler hours include boat and

shore angling effort which is a unit of fishing pressure. In 1993, the Meldahl pool had the highest fishing pressure with 125,669 total hours for that year (ODNR, 1996). The Greenup pool exhibited the second highest boating pressure in 1992 with 113,352 hours. Boating pressure counts include fishing boats and recreational boats. Motorized and non-motorized boats were also considered in the recreational boating category. Motorized boats include jet skis and non-motorized boats include canoes, row boats, sail boats, rafts, kayaks, and inflatable craft (ODNR, 1996).

Monthly pressure counts showed that May through August proved to be the most popular fishing months in the portions of the Greenup and Meldahl pools closest to the Greenup lock and dam (ODNR, 1996). Surveys on the recreational uses of the Ohio River are only available from early April through late November for 1992 and 1993. As a result, the recreational uses of the Ohio River during the months of December through March are unknown.

3.2.14.2 Environmental Consequences

3.2.14.2.1. Plan 3

The potential impacts from Plan 3 during and after construction are:

- Loss of fishing opportunities, both shore fishing and boat fishing during and after construction; and
- Loss of recreational boating during and after construction.

As stated in Section 3.2.7, Human Health and Safety, the construction site would be restricted for recreational users at all times. Boating and fishing would be restricted within the work area for 30 months or approximately 912 days while construction is occurring. Depending when the construction commences, it is possible that three prime boating and fishing seasons (May through August) would be lost, a total of 369 days. In water, Construction Work Limits (CWL) would be marked with buoys both upstream and downstream. The construction activities on land would require restrictive fencing in portions of the work zone. Orange fencing would also be used along the access road to the lock and as separation between the operations area and the construction area.

Once construction is complete, the recreation area upstream would be reduced, and the downstream area may be reduced as well. The longer approach walls in each direction for the longer lock would restrict recreational users from areas they were previously permitted to use.

To help compensate for the impacts associated with this alternative, the development of a fisherman access road along with a handicap access ramp may be developed along the Kentucky shoreline.

3.2.14.2.2 Plan 1B.

The impacts to recreation from Plan 1B are similar to the impacts expected with Plan 3. Reduction of the recreational areas both upstream and downstream would occur during and after construction.

The Corps may develop a fisherman access road along with a handicap access ramp along the Kentucky shoreline to compensate for the loss of recreation use during and after construction.

3.2.14.2.3 Plan 2.

Plan 2 would cause the same recreational impacts as Plan 3. As with other alternatives, a fisherman access road may be developed along the Kentucky shoreline.

3.2.14.2.4 Plan 4.

Plan 4 would cause the same impacts to recreation as the previous alternatives. The Kentucky fisherman access road may be developed as compensation for lost recreational opportunities.

3.2.14.2.5 No Action.

The potential impacts of the no action alternative are:

- Constraint on fishing opportunities, both shore fishing and boat fishing with continued congestion; and
- Constraint on recreational boating with the continued congestion.

Without the relief of ship congestion (idling barges) at the lock, constraints would continue and potentially increase on recreational activities.

3.2.14.3 Summary of Impacts

Summary of Impacts	
Alternative	**Impacts**
Plan 3	• Loss or reduction of fishing opportunities

	• Loss or reduction of recreational boating
Plan 1B	• Loss or reduction of fishing opportunities • Loss or reduction of recreational boating
Plan 2	• Loss or reduction of fishing opportunities • Loss or reduction of recreational boating
Plan 4	• Loss or reduction of fishing opportunities • Loss or reduction of recreational boating
No Action	• Constraint on fishing opportunities from congestion • Constraint on recreational boating from congestion

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APPENDIX A

ACRONYMS AND ABREVIATIONS

ACRONYMS AND ABBREVIATIONS

B&NL	Burgess & Niple Limited
BH	Backhoe
CAA	Clean Air Act
CDWR	California Department of Water Resources
CFM	Cubic Foot per Minute
CKY	Commonwealth of Kentucky
CO	Carbon Monoxide
cu yd	Cubic Yards
CWL	Construction Work Limits
DA	Department of the Army
db	Decibel
dBA	Decibel A-weighted
DNR	Department of Natural Resources
EDR	Environmental Data Resources
EPA	Environmental Protection Agency
FIVCO ADD	Five County Area Development District
ft	Feet
FTEs	Full Time Equivalents
gal	Gallon
gpm	Gallon per Minute
GVW	Gross Vehicle Weight
HCs	Hydrocarbons
hp	Horse Power
HTRW	Hazardous, Toxic and Radioactive Waste
KAR	Kentucky Administrative Regulation
KDES	Kentucky Department for Employment Services
KDNR	Kentucky Department of Natural Resources
KFWIS	Kentucky Fish and Wildlife Information System
KSNPC	Kentucky State Nature Preserves Commission
KWH	Kilowatt per Hour
LD	Loader
ME	Mechanical
MLI	Maurice Lamontagne Institute
NAAQS	National Ambient Air Quality Standards
NO_x	Nitrous Oxides
NDWP	Nevada Division of Water Planning
OBES	Ohio Bureau of Employment Services
ODH	Ohio Department of Health
ODNR	Ohio Department of Natural Resources
ORSANCO	Ohio River Valley Water Sanitation Commission
OSHA	Occupational Safety and Health Administration
Pb	Lead
PCB	Polychlorinated biphenyls
PM	Particulate Matter

POL	Petroleum, Oil, Lubricant
psi	Pound per Square Inch
SCS	Soil Conservation Service
SO_2	Sulfur Dioxide
THC	Total Hydrocarbons
USACE	United States Army Corps of Engineers
USAEWES	United States Army Engineer Waterways Experiment Station
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USGS	United States Geological Survey
VOCs	Volatile Organic Compounds
WVBEP	West Virginia Bureau of Employment Services

APPENDIX B

GLOSSARY

GLOSSARY

A-weighted. The A-scale sound level is a quantity, in decibels, read from a standard sound-level meter with A-weighting circuitry. The A-scale weighting discriminates against the lower frequencies according to a relationship approximating the auditory sensitivity of the human ear. The A-scale sound level measures approximately the relative "noisiness" or "annoyance" of many common sounds.

Absorbent. A material capable of taking in a substance, such as oil.

Accelerometer. An apparatus for measuring the velocity imparted by an explosion.

Ambient Air Quality Standards. Standards established on a state or federal level that define the limits for airborne concentrations of designated "criteria" pollutants (e.g. nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter, ozone, and lead) to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards).

Ambient Air. Any unconfined portion of the atmosphere: open air, surrounding air.

Attainment Area. An area considered to have air quality as good as or better than the National Ambient Air Quality Standards as defined in the Clean Air Act. An area may be an attainment area for one pollutant and a non-attainment area for others.

Backwater Area. A small, generally shallow body of water attached to the main channel, with little or no current of its own.

Bedrock. A general term for solid rock that lies beneath soil, loose sediments, or other unconsolidated material.

Benthic Species. Those organisms living at or near the bottom of a body of water.

Biota. All the plant and animals living in a particular area.

Bobbers. Buoys.

Bulkhead. A low wall of stones, concrete, or piling built to protect a shore from wave action.

Clamshell. A dredging bucket with hinges like the shell of a clam.

Cobble. Rock fragments that measure 7.6 cm (3 inches) to 25.4 cm (10 inches) in diameter.

Debris. Any material, including floating or submerged trash, suspended sediment, or bed load, moved by a flowing stream.

De minimis Criteria. Something that is so small as to be negligible or insignificant.

Decibels. The unit of measurement of sound level calculated by taking ten times the common logarithm of the ratio of the magnitude of the particular sound pressure to the standard reference sound pressure of 20 micropascals and its derivatives.

Dry Dock. A large dock in the form of a basin from which the water can be emptied or pumped, used for building or repairing a structure or ship below the water line.

Easement. A legal instrument enabling the giving, selling, or taking or certain land or water rights without transfer of title.

Effluent. Discharged wastewater.

Embayment. A bay.

Endangered Species. A species that is threatened with extinction throughout all or a significant portion of its range.

Environment. The total surroundings of an organism, including other plants and animals and those of its own kind.

Erosion. The wearing away of the land surface by various agents such as wind and water.

Floodplain. The lowland that borders a stream or river and is found outside of the floodway. It is usually dry, but subject to flooding.

Floodway. The channel of a river or stream and the adjacent land that must be reserved to discharge flood waters.

Habitat. A place where particular plants or animals occur or could occur.

Hazardous Waste. A waste or combination of wastes which, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may either cause, or significantly contribute to an increase in mortality or an increase in serious, irreversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed, of, or otherwise managed.

Herbaceous. A plant with no persistent woody stem above ground.

Intermittent Stream. A stream that carries water only part of the time, generally after periods of heavy runoff from storms or groundwater discharge.

Lock. An enclosed part of a canal or waterway equipped with gates so that the level of water can be changed to raise or lower boats from one level to another.

Miter Gate. Structure or device for controlling the rate of water flow into or from a canal or lock system.

Mitigation. A method or action to reduce or eliminate adverse program impacts.

Mooring. Apparatus used to secure or confine a ship to a place.

Noise. Sound that is perceived by humans as annoying and unwanted.

Resource (natural). Any form of matter or energy obtained from the environment that meets human needs.

Riparian Zones. Land areas directly influenced by a body of water. Usually such areas have visible vegetation or physical characteristics showing this water influence. Stream sides, lake borders, and marshes are typical riparian areas.

Riprap. A layer, facing, or protective mound of stones or rocks placed to prevent erosion, scour, or sloughing of a structure or embankment.

River Mile. Distance measured along the thalweg, a line running along the deepest part of the river channel.

Riverine Zones. Open-water habitats. Typically include all open water areas that occur within a defined channel of a stream as well as along perennial and intermittent stretches of streams.

Root Wad. Root mass of a tree, also called butt end.

Runoff. The non-infiltrating water entering a stream or other conveyance channel shortly after a rainfall.

Sediment. Particles derived from rock or biological sources that have been transported by water.

Sedimentation. The process of depositing sediment from suspension in water.

Sensitive Receptor. Areas defined as those sensitive to noise, such as hospitals, residential areas, schools, outdoor theaters, and protected wildlife species.

Silt Fences. Mitigation measure that prevents sedimentary particles from entering a specific area or body of water.

Site. Any location where humans have altered the terrain or discarded artifacts.

Species. All organisms of a given kind; a group of plants or animals that breed together but are not bred successfully with organisms outside their group.

Spoil. Soil or rock material excavated from a canal, ditch, basin, or similar construction.

Tailwater. The area encompassed from the base of the dam to the downstream end of the lock wall.

Threatened Species. A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Tributary. A stream or other body of water that contributes to another stream.

Turbidity. When water contains suspended matter that interferes with the passage of light through the water or in which visual depth is restricted. The turbidity may be caused by a wide variety of suspended materials, such as clay, silt, finely divided organic and inorganic matter, soluble colored organic compounds, plankton and other microscopic organisms and similar substances.

Weir. A horizontal structure or barrier placed across or parallel to a river to raise or divert water.

Wetlands. Areas that are inundated or saturated with surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil, including, swamps, marshes, bogs, and other similar areas.